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JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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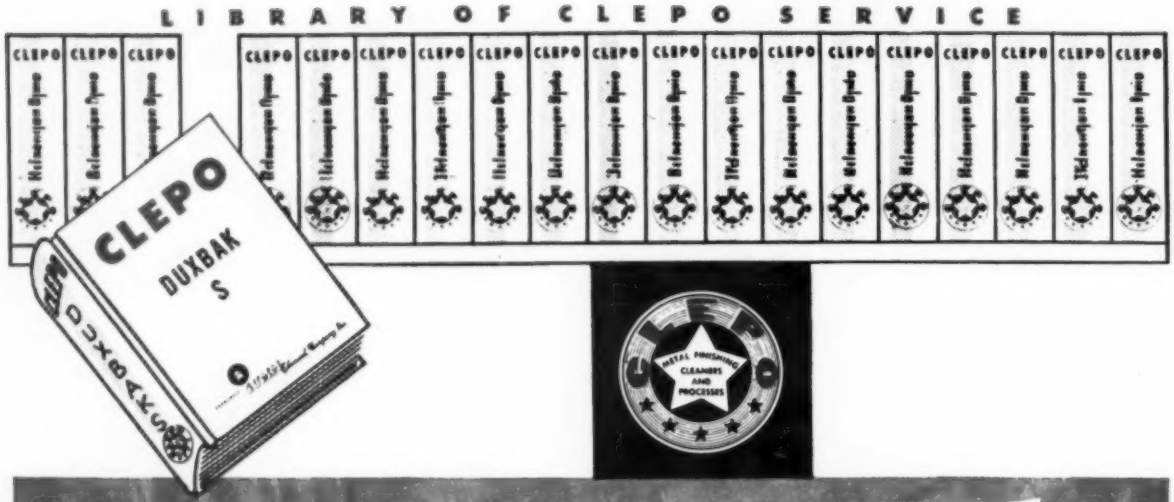
ORGANIC COATING · MARCH 1959



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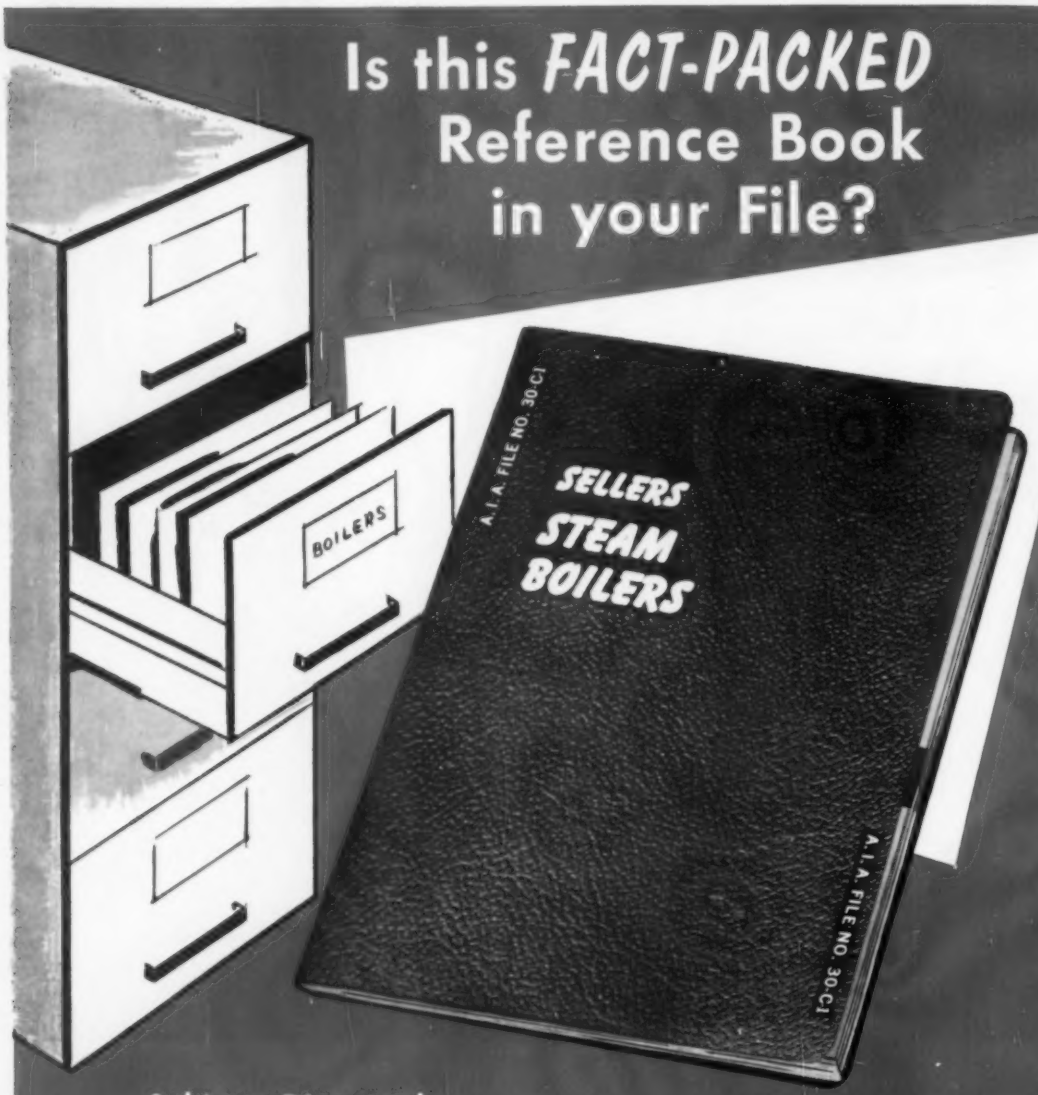

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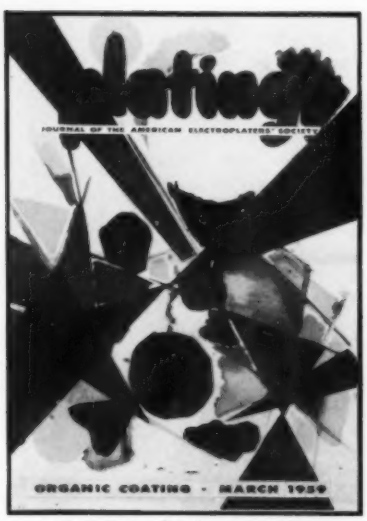

Cover Designed by James A. Civille.

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JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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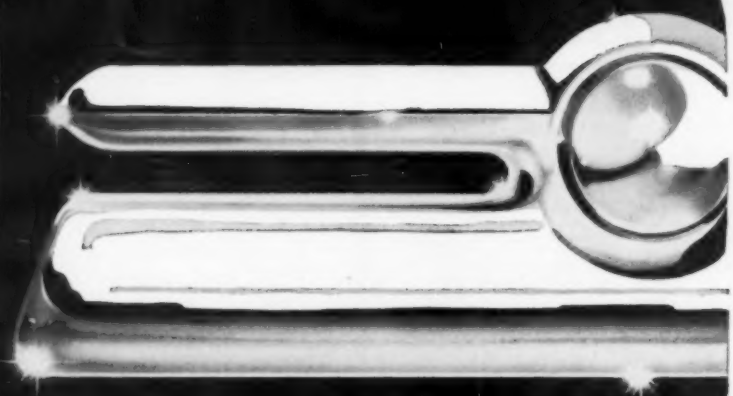

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Harshaw's research and development laboratory solved the problem of plating nickel on nickel. This, coupled with the use of a sulfur-free nickel plate and a bright nickel from a compatible bath, has made possible a Duplex deposit with unequalled corrosion resistance.

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EDITORIAL

ORGANIC FINISHING
REVIEW AND PREVIEW

SEVERAL YEARS AGO when then President Heiman made his appointments to the newly organized Organic Finishing Committee, very little attention was being paid to this subject by the average Branch Librarian or Educational Committee. Several of the Branches were having perhaps one meeting a year devoted to this "foreign" subject and the latter part of our motto, "The Finishing of Metals and Allied Arts" was the "step child" of our Society, not even mentioned on Branch stationery.

There being so few requests for talks or papers on Organic Finishing, minimum coverage was given to the subject until the March 1957 issue of PLATING was declared our first Organic Coating issue, and the Milwaukee Branch instituted its "Dual Meeting" idea on December 7, 1956. Since that date, many Branches have given it a prominent part in their educational program and many of the Annual Meetings have placed it on an equal status with electroplating. The March 1958 issue of PLATING was again devoted to the subject, as is this March issue. At the 1958 Convention in Cincinnati, three papers were given on the various aspects of Organic Finishing.

Each year, as a result, it is becoming easier to obtain interesting papers and talks covering all phases of the Organic Finishing subject. No other Society has acted as an outlet for information at the practical or application level and since the AES now champions the issue, many authors have been inspired to pass their information on to others.

At our 1959 Golden Jubilee Convention and International Conference on Electrodeposition and Metal Finishing to be held in Detroit, three separate (dual) sessions will be devoted entirely to Organic Finishing. With this National and International emphasis, our educational committees and librarians should find it more convenient to schedule interesting meetings on the subject. The added interest of a new subject will open a new field of candidates for membership and the opportunity of increasing our membership is presented to every Branch.

Our Society has enjoyed a continued growth during the past fifty years and to be of maximum service to the membership, it must continue to expand in the future. Only through the opening of new fields of interest and further development of the present fields can our Society live up to its motto, "The Advancement of the Science of Electroplating, the Finishing of Metals and Allied Arts."

Ralph D. Wysong

First Vice President

Complete Versatility *plus* One-Man Operation!

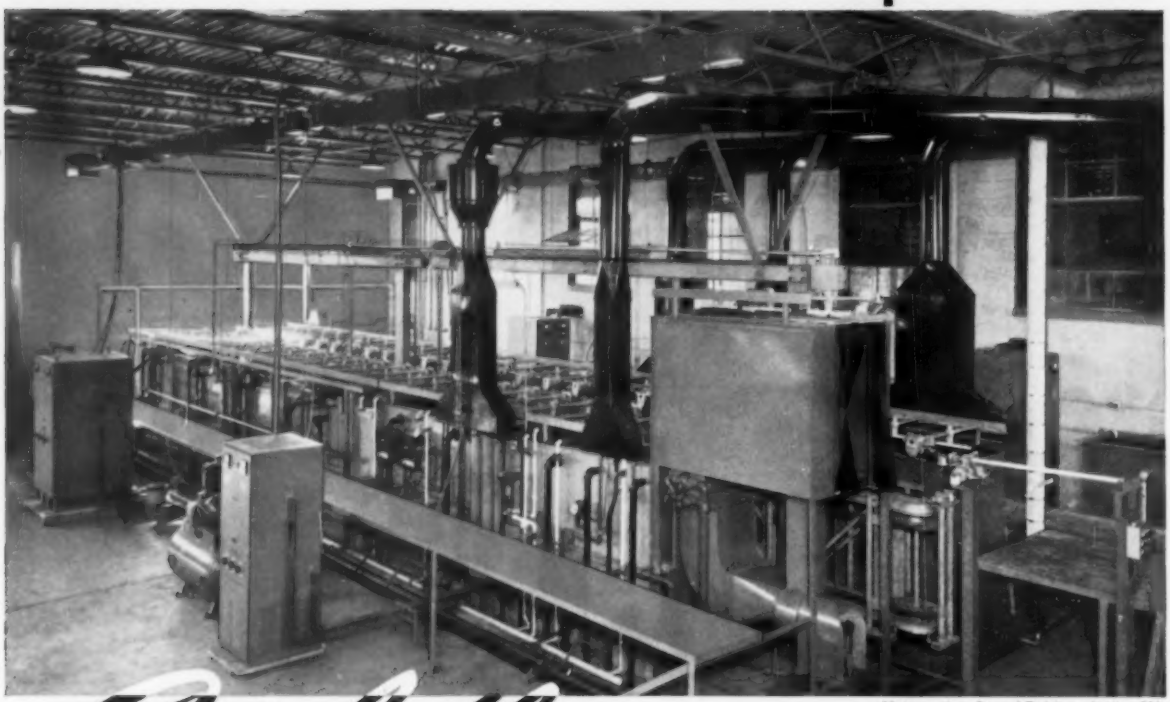

Photo courtesy General Finishers, Canton, Ohio

Cycleflex AUTOMATIC PLATING & ANODIZING MACHINE

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NO CONVEYOR BREAKDOWNS New electro-mechanical control, and safety devices, positively prevent racks from jamming into tank sides—keep load from dropping if power fails during work transfers

LOW HEADROOM All elevating mechanisms operate below top level of rack carrier

Hydraulic operation, standard
Pneumatic operation, optional

SELF-CLEANING CONTACTS Need practically no attention—insure positive six-point connections. Heavy duty design

EASILY REMOVED RACK CARRIERS Tank surfaces are kept clear—a big advantage when manual plating large workpieces, and when servicing

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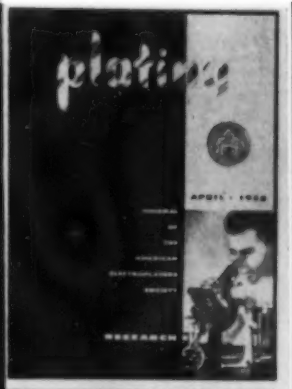

WHY PLATING MAGAZINE ADVERTISING PAYS!

As American Electroplaters' Society, Inc. (AES) entered its FIFTIETH ANNIVERSARY fiscal year on July 1, 1958, its PLATING MAGAZINE, itself nearly a half-century old, enjoyed, as would be expected, the largest paid circulation in the electroplating and metal finishing field. In fact, in the East North Central, Middle Atlantic and New England sections of the United States, principal concentration areas of plating and metal finishing enterprises in this country, PLATING's paid circulation margin over closest contender exceeded 1500 paid subscribers in these regions alone.

Aside from largest audited paid circulation, other values offered by PLATING to its advertisers include, 1) lowest advertising rates, 2) stability demonstrated by the highest paid circulation renewal percentage in this field, 3) steadily burgeoning audience of prospective product buyers intimately, individually reached.

Without obligation of any sort, write or call PLATING's Advertising Department for a copy of its Rate Card and latest Publishers Statement for your comparison. Request a free copy of its popular "Market Data and Media File". Appraise, compare, then invest in PLATING MAGAZINE advertising, particularly in its unique GOLDEN JUBILEE ISSUE (June 1959). Your product and institutional merchandising will benefit from PLATING prestige, coverage, other values.*

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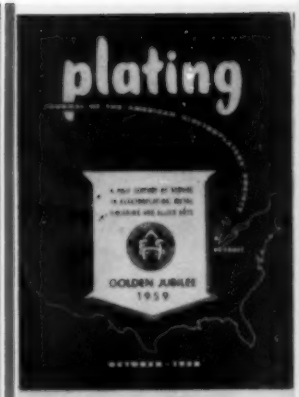

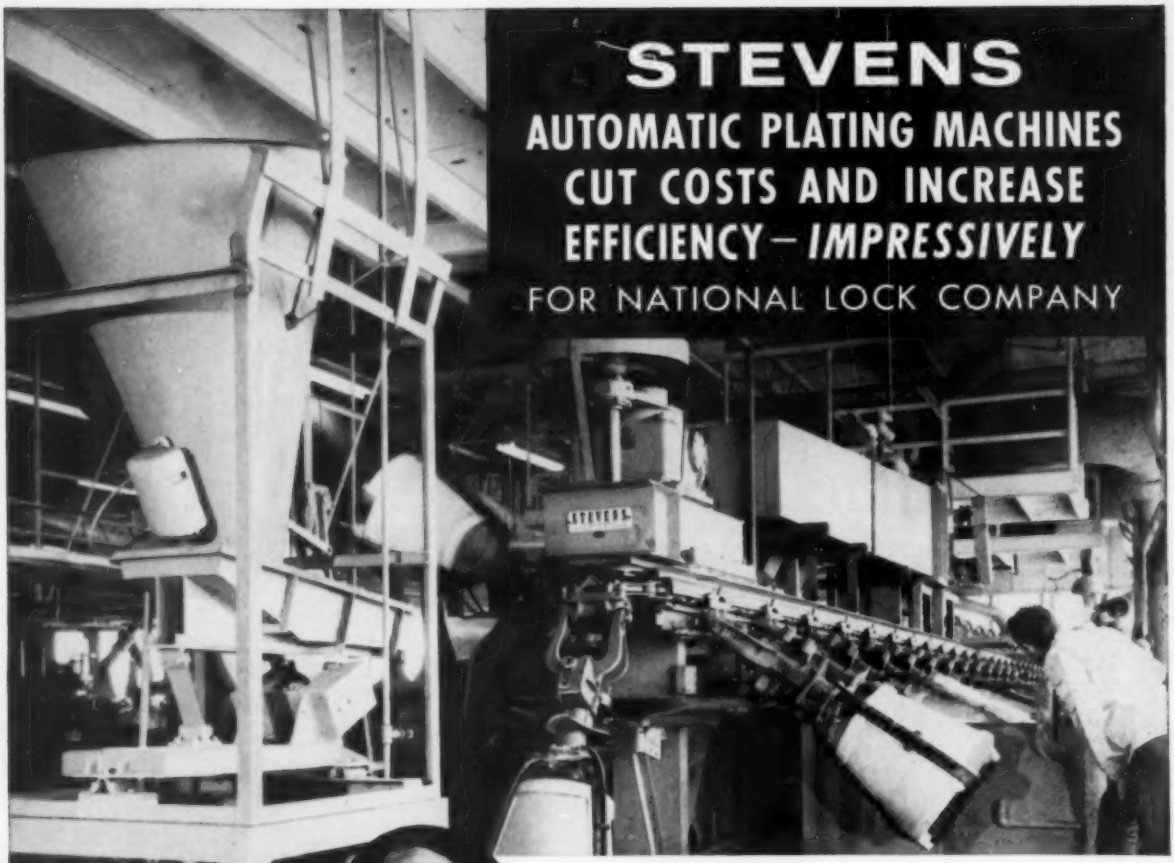

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AUTOMATIC PLATING MACHINES CUT COSTS AND INCREASE EFFICIENCY—*IMPRESSIVELY*

FOR NATIONAL LOCK COMPANY

Read what Paul Repka, assistant plant engineer for National Lock Co., Rockford, Ill., says about his company's Stevens automatic machines:

"When we installed our battery of three Stevens Automatic Plating Machines in 1957, we were rewarded by an immediate increase in efficiency and an accompanying reduction in plating costs. The machines keep up with demanding production schedules easily. And their noteworthy savings in material and labor costs have proved to us that for high-volume, low-cost metal finishing, Stevens Automatic is the right answer."

Just as Mr. Repka did, an ever-growing number of metal-finishing and plating executives are learning of the increased production capabilities and cost-cutting abilities of Stevens automatic plating equipment. If your present method of plating isn't giving you all you expect of it, contact your local Stevens sales representative now. Let him show you the automatic Stevens way to more profitable plating and processing.

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Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

1. LONGER LIFE

Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.

4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies". Or, write for technical data and product list giving details of your operations.

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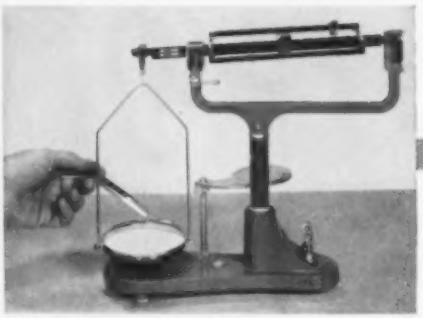
Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies For Metal Finishing

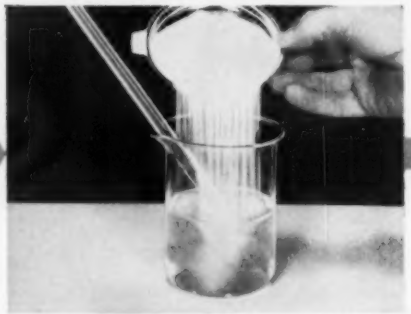
Du Pont announces–

A new potassium-copper for "direct-route" bath

New Way—"Direct-Route" Method



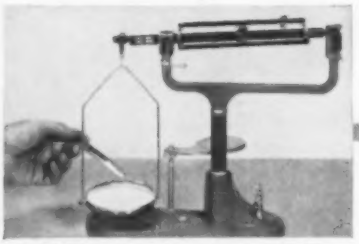
1 Weigh required amount of new potassium-copper cyanide double salt



2 Dissolve double salt in water, or in plating solution

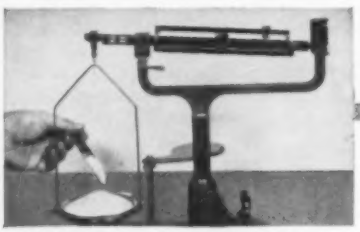
Laboratory demonstration shows how direct route saves time

Old Way



1 Weigh required amount of potassium cyanide

2 Dissolve the potassium cyanide in water



3 Weigh required amount of copper cyanide

4 Add copper cyanide to water and make a slurry

5 Dissolve copper cyanide slurry in potassium cyanide solution

NEW POTASSIUM-COPPER CYANIDE DOUBLE SALT

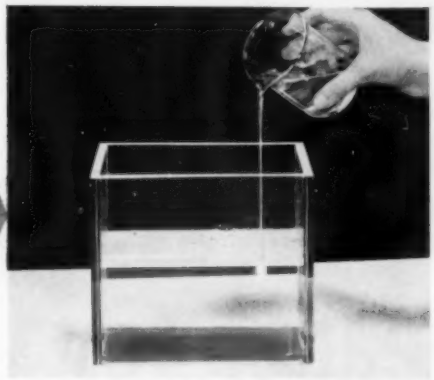
	SPECIFICATIONS	TYPICAL ANALYSIS
Copper	25.8%	26.3%
"Free" potassium cyanide	1.25% to 3.0%	2.9%
Lead	7 ppm. max.	Less than 1 ppm.
Sulfides (as sulfur)	10 ppm. max.	Less than 5 ppm.
Insolubles	0.01% max.	Trace

SODIUM COPPER-CYANIDE DOUBLE SALT

	SPECIFICATIONS	TYPICAL ANALYSIS
Copper	28.7% min.	29%
"Free" sodium cyanide	0.4 to 2.0%	1%
Lead	7 ppm. max.	Less than 1 ppm.
Sulfides (as sulfur)	10 ppm. max.	Less than 5 ppm.
Insolubles	0.01% max.	0.01%

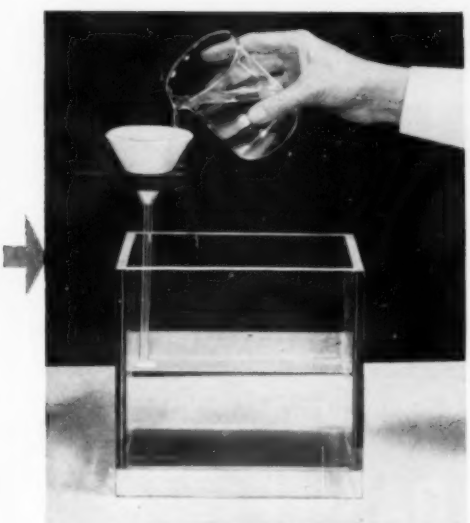
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 307.

cyanide double salt make-up and replenishment



3 Add directly to plating tank—no filtering necessary

. . . avoids errors.



6 Add solution through filter to plating tank

Like its sodium double salt counterpart, this new Du Pont chemical saves time . . . helps avoid mixing errors

Now . . . the same advantages of Du Pont sodium-copper cyanide double salt are available in a *potassium* salt. New Du Pont potassium-copper cyanide double salt offers platers the speed and convenience of a high-purity copper-plating chemical for potassium copper baths. It eliminates several mixing steps . . . offers a direct route in preparing plating baths (see chart).

Like its sodium counterpart, this new potassium double salt is white, crystalline and readily soluble. It's made from ingredients of highest quality and purity—Du Pont copper cyanide and potassium cyanide. Since the new salt has low lead and sulfide, it's suitable for use in bright copper baths. Here's how potassium-copper cyanide double salt helps you:

SAVES TIME—You handle one chemical instead of two separate chemicals . . . eliminate several steps usually required to dissolve copper cyanide. Just weigh out the double salt and dissolve it in water or plating solution. A "direct-route" process!

AVOIDS WASTE AND COSTLY MIXING ERRORS—Active ingredients are in the proportions usually required. This simplifies making and replenishing bath . . . prevents waste resulting from undissolved copper cyanide or potassium cyanide.

IMPROVES SAFETY—With just one salt to dissolve you minimize handling steps. This means greater convenience—more safety.

SIMPLIFIES CALCULATIONS—Balanced composition of potassium double salt makes it easy to determine amounts required for make-up or replenishment. (1 oz. potassium-copper cyanide double salt is equivalent to 0.26 oz. copper, or 0.37 oz. copper cyanide.)

Both potassium and sodium double salts are shipped in convenient moisture-resistant 100-lb.-net fiber containers. They're two of Du Pont's full line of high-quality products for copper plating—including Copper Cyanide, Potassium Cyanide and all-purpose "Cyanobrik" and "Cyanogran" M sodium cyanide. You can count on prompt shipment of these materials, wherever or whenever you need them, from Du Pont, your reliable domestic source.

FOR FURTHER INFORMATION or Technical Service call your Du Pont distributor or Du Pont District Office listed below.

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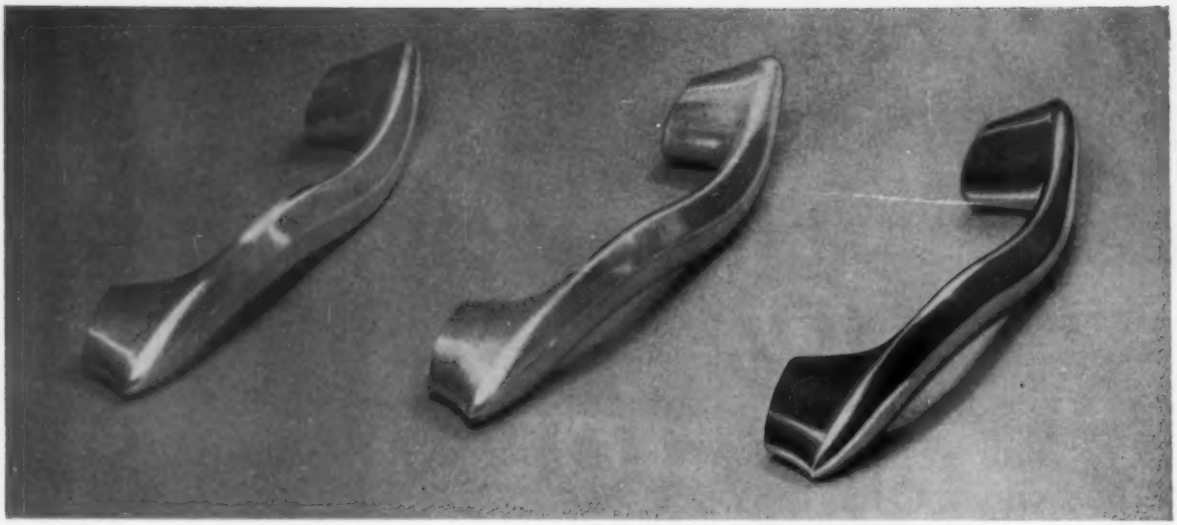

Three stages in the finishing of a zinc base die casting. Casting at left was buffed. Center casting was buffed and electrocleaned in Oakite 195. Casting at right was buffed, electrocleaned in Oakite 195, and plated. Note that center casting retains full buffed lustre and color after its electrocleaning in Oakite 195.

New electrocleaner for zinc die castings assures brighter plate... and cuts rejects!

Plating of zinc base die castings now becomes a more dependable, more economical operation with the introduction of Oakite 195, a *non-etch* anodic cleaner.

More dependable because the casting surface is not etched and its color not changed or darkened. Soils and films are effectively removed, yet the castings retain their buffed lustre. To help further in preparing the way for uniformly good plating results, this new electrocleaner has excellent rinsability in hot or cold water, and low foaming tendency.

And more economical by far, because of the sharp reduction in rejects due to poor pre-cleaning.

Oakite 195 can be used with direct, reverse and periodic reverse current, in still tanks and fully automatic set-ups. Where only a single solution tank is available, it is being used to clean a variety of metals —zinc, steel, brass, copper.

For more information about this important new development in cleaning before plating, write for descriptive folder F-10466 to Oakite Products, Inc., 40 Rector Street, New York 6, N. Y.

OAKITE

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The proved nickel alloy chemical plating—available only from General American and its licensees

KANIGEN is a chemically and metallurgically unique process for applying a hard, corrosion and abrasion resistant surface to most metals. KANIGEN is being used successfully for coating almost everything of any size—from the inside of a tank car to a tiny surgical needle—providing extreme uniformity of coating thickness even on complex shapes. Rack, jig or barrel plating may be used with KANIGEN.

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KANIGEN is a trademark which identifies chemical nickel coating by General American Transportation Corporation and its licensees, the product resulting therefrom and compositions produced by them for use in chemical nickel coating.

KANIGEN is available from General American at East Chicago, Indiana; Sharon, Pennsylvania, and Compton, California, and from licensees in many cities. For further information, call or write.

PHYSICAL PROPERTIES

Specific gravity 7.9
Melting point ..... 1635 °F
Electrical resistivity
approximately 60 micro-ohms/cm/cm²
Coefficient of expansion
13 x 10^{-6} cm/cm per °C or
7.22 x 10^{-6} in/in per °F
Thermal conductivity
approximately 0.0105 to
0.0135 cal/cm sec °C (calculated)
Hardness
as plated—49 Rockwell C
heat treatable to 70 Rockwell C

World's largest production facilities for chemical nickel alloy plating on

Iron
Copper
Aluminum
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and their alloys

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Kanigen Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

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Project Alert, as a philosophy of re-awakening, of renewed enthusiasm, of mental alertness, has shown wonderful results since its initiation last fall. Many organizations have asked us for supplies of Project Alert folders and buttons so that they may introduce it to their people. Leading magazines and newspapers, too, have given Project Alert splendid support.

1. Project Alert, as a sound product promotion, has worked because each of the three product presentations has included a true specialized service, an economically sound value, and a new product.

Like the product presentations still to come, they are based entirely on *customer benefit.* Customer recognition of these values, measured by their response, has been excellent.

2. Adoption of the philosophy to your own organization will help you as surely as it has helped others. And keeping your eye on Udylite product presentations and their sincere true value offerings can only add to your profits.

If you want to adopt the Project Alert philosophy, we'll be glad to help you. And if you haven't seen our Project Alert product presentations, we'll furnish you copies on request.

Ask your Udylite sales representative, or write direct to us in Detroit

C. H. REEME,
president

the udylite corporation

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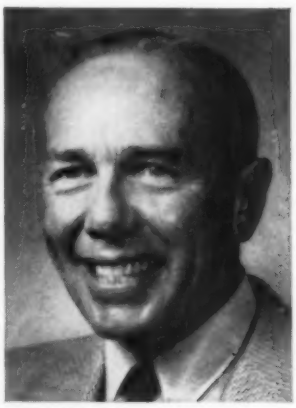

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SECOND: Udylite offered an unmatchable service for modernizing old rectifiers to give them the benefit of the latest high efficiency rectifier developments.

THIRD: *Now*, Udylite offers a *no charge* technical service for the inspection of your Udylite Full Automatic machines and the recommendation of what is needed to put them in top operating conditions.

THE PLAN AND THE PROMISE:

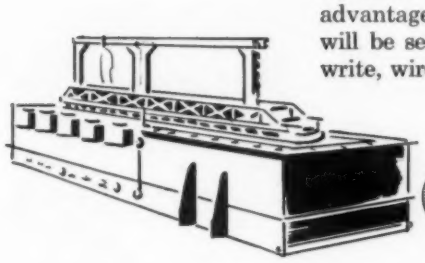
Your Udylite representative will call on you and offer this special service:

1. A factory-trained service man will call at your plant, at your convenience, to determine if your machines need service and/or parts.
2. If they are needed, he will give you, *at that time*, a quotation at the special low prices established for this Project Alert program.
3. On your acceptance of the quotation, parts will be shipped promptly from a special department at Udylite. When they arrive at your plant, the Udylite service man will return and supervise your people in their installation.

THE ADVANTAGES:

1. Complete machine inspection without charge to you.
2. Immediate and complete quotation, if work or parts are needed.
3. Udylite factory supervision in your plant.

All three Project Alert plans are working. And all their advantages are yours for the asking. Your Udylite man will be seeing you soon. But if you need prior service, write, wire or call us *today*.



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Rigid box-type construction
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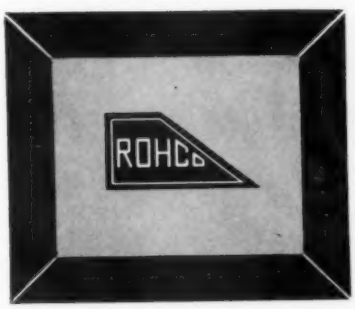
Benefit from the plating "Know How" of these unequaled ROHCO Brighteners on your work. Write for details, today.



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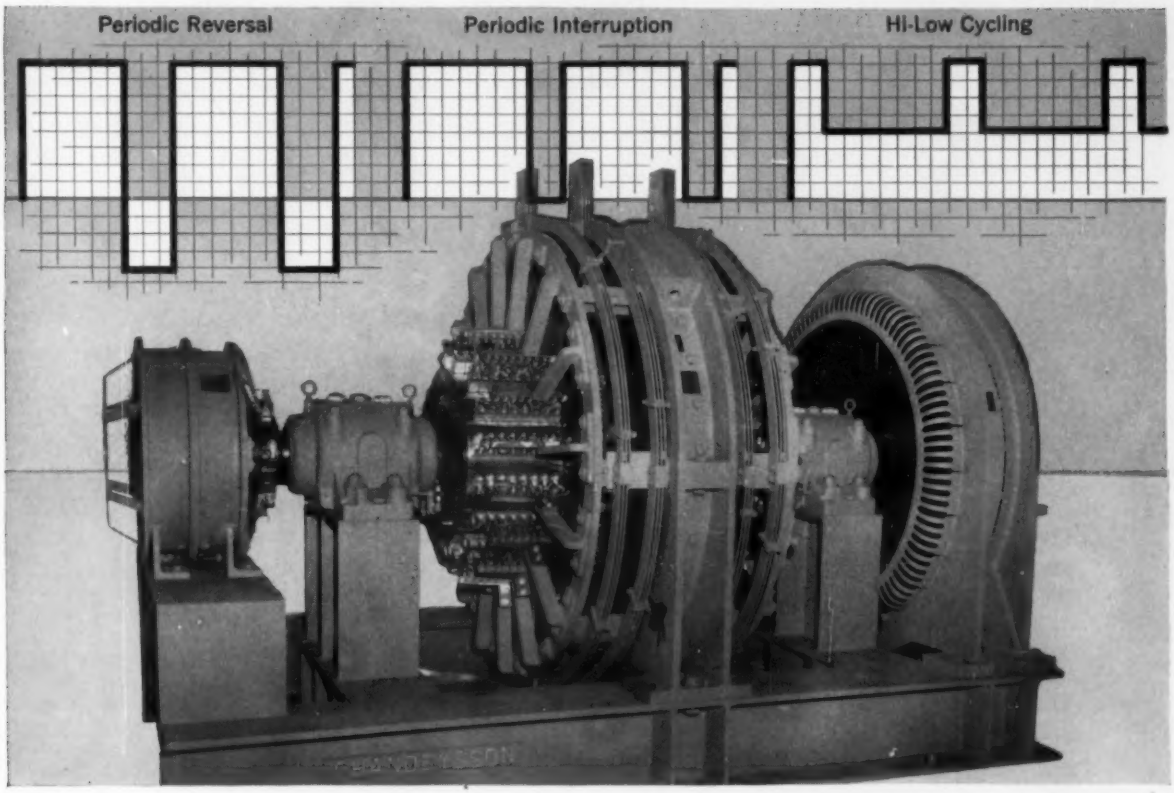

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Chandeysson **generators keep pace with changing needs of your plating operation.**

Throughout the plating industry, companies depend on Chandeysson Motor Generators as their most flexible form of low-voltage power. When plating current must be reversed, interrupted, or changed suddenly, generators do the job at a much lower additional cost than other types of power conversion equipment. Usually, extra control gear costs less than 2% of the original M.G. set price. Comparable changeover nearly *doubles* the cost of other kinds of power conversion equipment.

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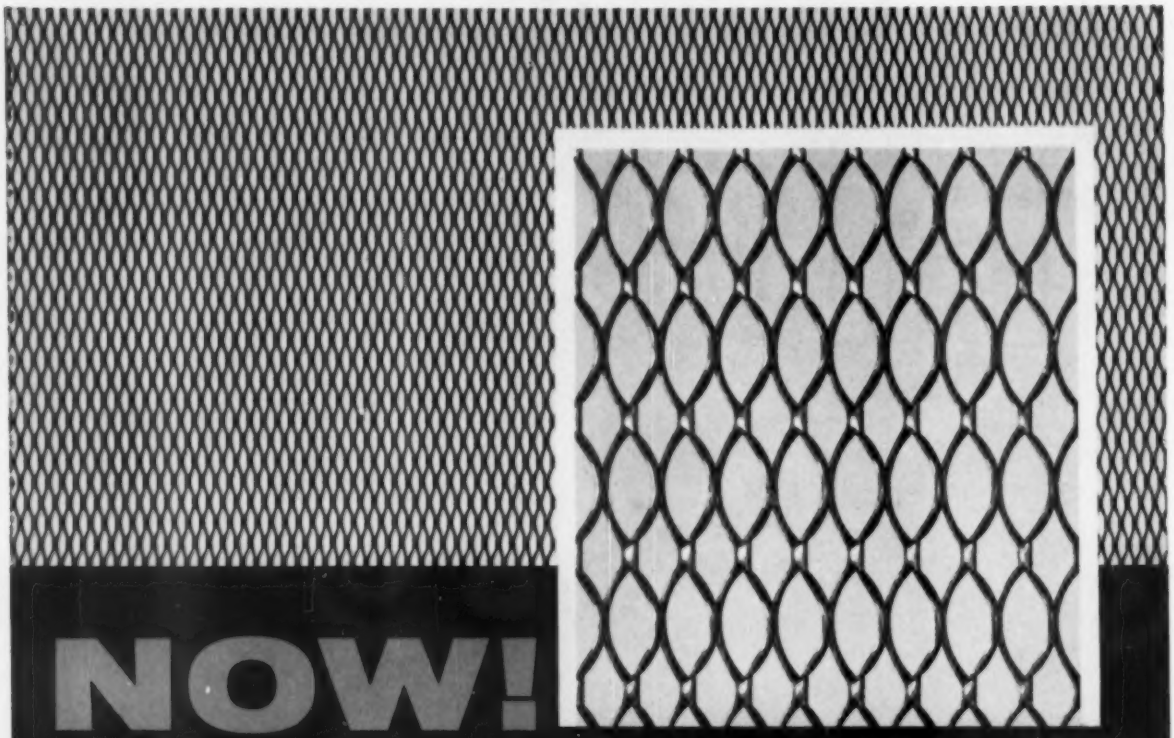

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with General Plate Expanded Platinum-Clad Tantalum Anodes

- **Provide greater anode distribution**
- **Offer service life equal to solid platinum**
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Platinum clad to one side of tantalum sheet, and then expanded to a mesh can substantially reduce your cost over solid platinum anodes. The greater distribution of anode surface obtained by expanded clad metal allows more uniform plating.

The tantalum layer isn't affected by chemicals in the plating bath nor does it contaminate the bath.

Generally, where solid sheet platinum electrodes are used, the "back" surface is almost inoperative. For this reason, even though the tantalum surface becomes passive after a few minutes of use, double cladding is not necessary.

Because General Plate platinum-clad tantalum anodes are made by a patented solid-phase cold bonding process, there is no diffusion between the platinum and tantalum, a phenomenon which occurs in other methods of cladding. You are assured of solid platinum performance.

Why not *reduce your cost* of rhodium electroplating anodes by using General Plate expanded platinum-clad tantalum. Write today for more information, or send us your specifications and we will gladly quote on your requirements.

You can also profit by Using General Plate Rhodium Plating Solutions

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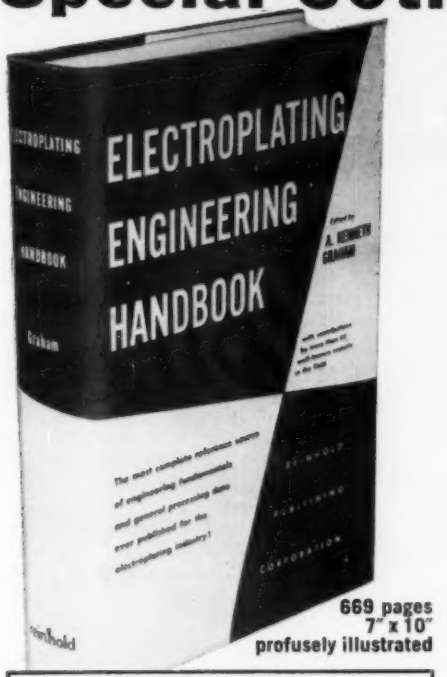
to Members of the American Electroplaters' Society

In connection with its Golden Anniversary, the AES, through a special arrangement with the publisher, is pleased to offer its members an exceptionally low price on an outstanding reference book for electroplaters.



669 pages
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ELECTROPLATING ENGINEERING HANDBOOK

Edited by **A. KENNETH GRAHAM**, President of Graham, Savage & Associates, Inc. in collaboration with over 40 widely-known authorities in the electroplating field.

The complete data book long needed by everyone in the electroplating and metal finishing field. With this big, 669-page book at hand, you can quickly find the answer to practically every imaginable engineering or processing problem!

Jam-packed with tables, charts, plans and illustrations, this Handbook brings you all the most recent information available on processing techniques and the engineering factors involved in constructing and installing plating equipment. Full chapters cover the design of parts to be plated, metal surface preparation, standards and specifications, bath compositions, processing sequences, waste treatment, manual and automatic plating machinery, filtration, rinsing and drying, and all other engineering and operating considerations.

No matter what your interest in the electroplating field—engineer, designer, equipment manufacturer, executive, shop superintendent, purchasing agent, or user of electroplated parts—you'll find just the information you're looking for every time you use this *complete* Handbook.

Check This Wealth of Information

Glossary, **PART I**—GENERAL PROCESSING DATA. Tables of Data. Design for Plating. Metal Surface Preparation and Cleaning: Basis Metal Surface, Polishing, Brushing, and Buffing, Barrel Finishing Methods, Bulk Finishing Small Parts, Finishing Large and Precision Type Parts, Electropolishing, Metal Cleaning, Oxide Removal. Typical Processing and Operating Sequences. Water Requirements for Plating. Plating Bath Compositions and Operating Conditions. Plating Standards and Specifications. Trouble Shooting. Analysis of Plating Baths. Testing Electrodeposited Coatings. Waste Disposal. Plating and Metal Finishing Costs. Industrial Hygiene and Safety. Metallurgy for the Electroplater. Surface Protection and Finishing Treatments: Phosphate Coating Processes, Chromate Conversion Coatings, Chromic Acid Anodizing of Aluminum, Sulfuric Acid Anodizing and Oxide Treatments for Aluminum and Magnesium. **PART II**—ENGINEERING FUNDAMENTALS AND PRACTICE. Plant Location and Layout. Floors—Plans and Construction. Tanks. Linings. Heating and Cooling Practices and Equipment. Racks: Design, Construction, Insulation and Maintenance. Manually Operated Installations. Barrels. Semi- and Fully-Automatic Plating Machines. Continuous Plating Equipment for Steel Mill Products. Anode and Cathode Rod and Bus Systems. Exhaust Systems. Anodes and Cathodes—Types, Composition and Related Data. Low-Voltage D-C Generators. Rectifiers. Periodic Reverse Current Plating. Rinsing. Drying Practices and Equipment. Filtration. Auxiliary Equipment for the Plating Room. Maintenance. Index.

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TRADE LITERATURE

L—301. Ultrasonic Cleaner—A new data sheet is now available on the giant size Series 5000 Narda SonBlaster ultrasonic cleaner manufactured by The Narda Ultrasonics Corp. The series consists of 23 systems for applications to mass-production cleaning or degreasing of mechanical, electronic, optical, horological, aircraft or missile parts or assemblies; to rapid cleaning of radioactive elements, and to expediting metal finishing and chemical processing of many kinds.

The data sheet describes Model G-5001, a 40-kc, 500-w average output SonBlaster generator designed for energizing a wide range of cleaning tanks, and the G-5002, a 20-kc 500-w average output generator.

L—302. Vinyl Coatings—A new illustrated folder on Pennsalt strippable vinyl coatings for the aviation, appliance, automotive and metalworking industries has been published by the metal processing department of Pennsalt Chemicals Corp. The folder, which includes an actual sample of the tough Pennsalt X-1000 strippable vinyl coating, suggests application techniques, stripping and some of the variety of uses for the product.

Transparent and flexible, these high tensile strength coatings can be used to protect and moisture-seal aluminum, stainless steel, copper, brass, bronze, alloys and plated surfaces, green or wet plaster molds, mockups, splashes, casts, finished and semi-finished parts of metal, wood and plastic.

Easy to apply with standard paint spray equipment, the coatings can be stripped quickly, simply by loosening one edge of the coating and peeling it off. This feature also provides a removable protection for walls behind paint or lacquer spraying areas, eliminating periodic clean-ups to remove paint buildups.

L—303. Abrasive Head—New literature describes features of Abrasive Machinery's Smooth-O-Matic contour sanding head. For use on metal, new design permits greater control of scratch pattern with varying surface shapes. Both aluminum oxide and silicon carbide grits can be used in all grades. Unit permits complete use of abrasive coated materials. Exclusive design of Smooth-O-Matic head incorporates coated abrasive supply rolls which advances the abrasive as it is required.

L—304. Auxiliary Tumbling Barrel—A new bulletin on auxiliary tumbling barrels for wet blast equipment has been published by the Techline Division of Wheelabrator Corp.

Deburring and precision cleaning of small parts that can be tumbled are accomplished rapidly and uniformly in wet blast equipment through the use of the tumbling barrel. Whereas the manual wet blasting of very small parts is a laborious, time-consuming operation, the use of a tumbling barrel permits large quantities of such parts to be finished automatically.

Contained in the bulletin are complete operating instructions as well as mechanical and operating specifications.

L—305. Coated Abrasives—A new, practical information kit to make it easier to specify and order coated abrasives is now available from The Carborundum Co. In the kit is a Buyer's Guide, Form A 1506, with convenient reference tables and forms for listing requirements, a Selector Chart for Metalworking Operations, Form A 1507, a compact brochure, Basics in Coated Abrasives for the Metalworking Trades, Form A 1509.

(*Continued on page 232*)

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BUCKINGHAM PRODUCTS
BUCKY
3,000,000 LBS. IS A LOT OF
K-260-G
STAINLESS STEEL BUFFING COMPOSITION
IT MUST BE GOOD
OVER 3,000,000 pounds sold since first introduced.
Outstanding for CUT and COLOR when used with all types Sisal Buffs... Also produces high color with cloth buffs.
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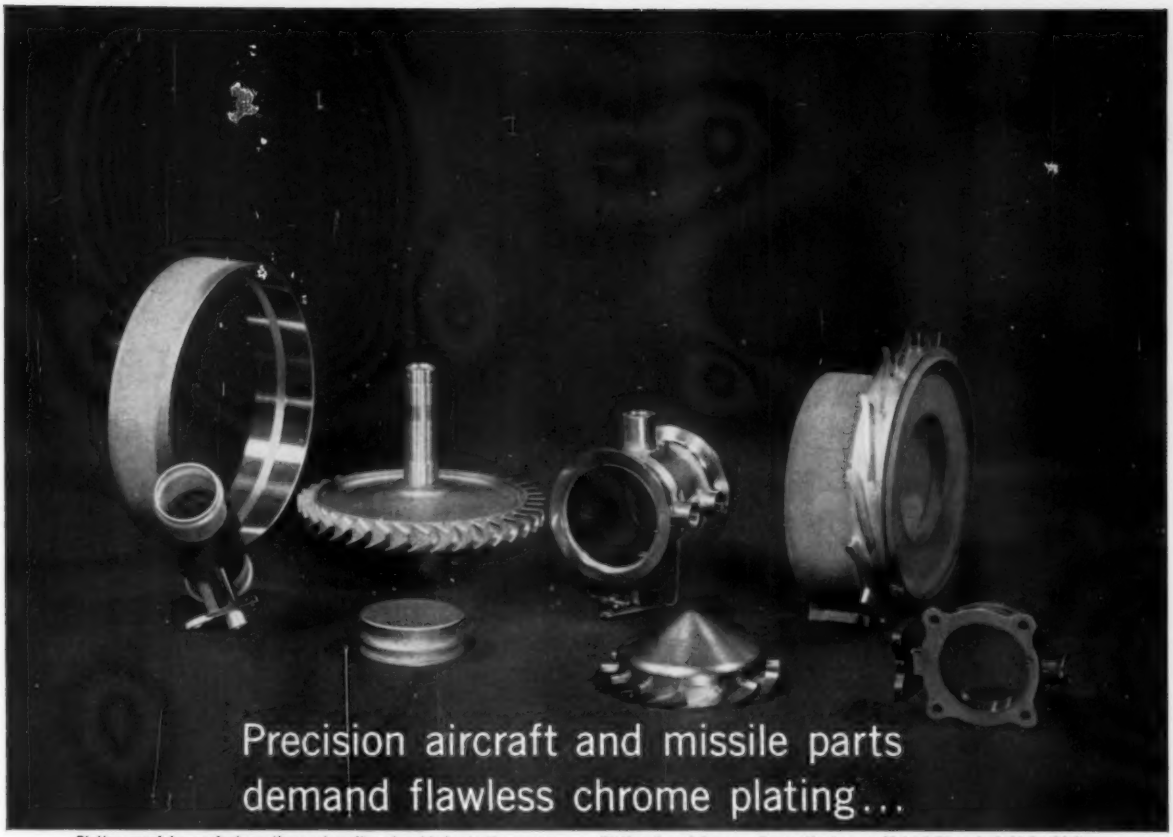

Plating **must** be perfect on these aircraft and guided missile components, made according to rigid government specifications. Precision Plating Co. of Somers, Connecticut, uses Mutual Chromic Acid for high plating accuracy—and dependable product performance.

For the best chrome plating use
MUTUAL low-sulfate CHROMIC ACID

Experienced platers working with close tolerance specifications have found the best way to maintain accurate control of the acid-sulfate ratio in the plating bath is to use Mutual low-sulfate Chromic Acid.

Mutual Chromic Acid is always 99.75% pure—or better. Sulfate content never exceeds 0.1%. Rigid Mutual quality control guarantees uniformity of the product—a safeguard against plating difficulties and expensive rejects!

For further information about Mutual Chromic Acid, send today for "Chromium Chemicals." This booklet contains useful technical information about the entire line of Mutual Chromium Chemicals. The Mutual Technical Service Staff will also be pleased to offer expert help.

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News about COATINGS FOR METALS

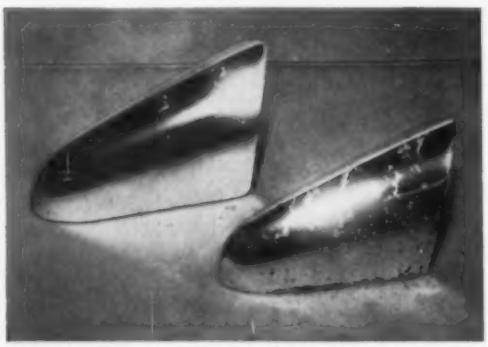
from Metal & Thermit Corporation

How to match chromium plate to service requirements

No longer is all chromium plate alike physically despite the fact that it remains the same *chemically*.

FOR MORE CORROSION RESISTANT BRIGHTWORK

The newest type of bright chromium plate offers much greater corrosion resistance than previously obtainable. It is free from the microscopic cracks inherent in ordinary chromium deposits and thereby prevents corrosives from contacting the underlying metal. For this reason, Unichrome *Bright* Crack-Free Chromium makes a major improvement in the corrosion resistance of decorative brightwork. It assures more uniform plate distribution and ample thicknesses in recesses. And with freedom from the cracks characteristic of ordinary chromium, Bright Crack-Free Chromium actually *reinforces* the resistance of the copper and nickel undercoats normally used.

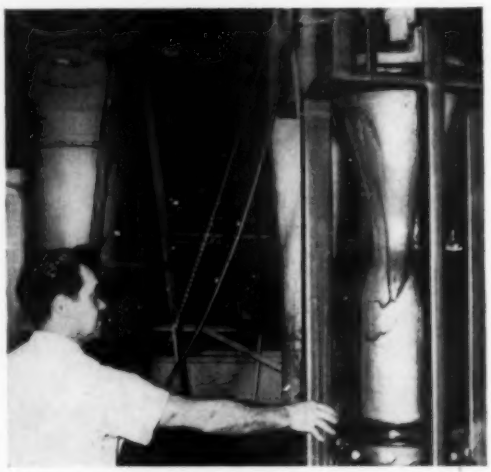


Bright Crack-Free Chromium promises to put an end to pitted and rusted auto brightwork. It plates without cracking, and eliminates pores by producing thicker bright deposits free from cracks. (Compared with ordinary chromium after 72-hour acetic acid salt spray test.)

TO OVERCOME CORROSION, WEAR, HEAT

Another new type of plate, Unichrome *Industrial* Crack-Free Chromium, delivers greatly improved corrosion, wear, and heat resistance for industrial or engineering-type applications. A ductile matte deposit free from corrosion-admitting cracks, it has excellent resistance to impact, abrasion, and thermal shock. Hardness ranges from 500 to 700 Knoop.

These properties of Unichrome Industrial Crack-Free Chromium are used to protect rocket engine assemblies subjected to hot, erosive, corrosive combustion gases. They also solve corrosion and wear problems on parts such as hydraulic rams, power steering shafts, high temperature molds, and washing machine shafts.



Resistance to thermal shock and superior corrosion resistance suit Unichrome Industrial Crack-Free Chromium for such uses as plating of rocket engine combustion chambers.

FOR OTHER APPLICATIONS

A third process, Unichrome SRHS® Chromium, has proved uniquely successful in applications where freedom from cracks is not required. It plates up to 80% faster than the ordinary chromium process, deposits chromium with less dulling and burning due to its unusually wide bright plate range. Its unique production advantages lead to an engineering benefit: more uniform control of plating quality.

NOTE: SRHS Chromium excels for plating stainless steel, enabling platers to "color-match" all brightwork on a product.

Send for bulletins giving more details. Write Metal & Thermit Corp., Rahway, N. J.

METAL & THERMIT CORPORATION

GOLDEN JUBILEE ISSUE ADVERTISING RESERVATION

THE Fiftieth Anniversary observance of the American Electroplaters' Society, Inc. (AES) will be climaxed not only by the AES's Golden Jubilee Convention and Industrial Finishing Exposition, including the Fifth International Conference on Electrodeposition and Metal Finishing, to be held in Detroit, June 15-19, 1959 but also by the GOLDEN JUBILEE ISSUE of AES's PLATING MAGAZINE (June 1959).

A FEATURE edition beamed to command global readership appeal by the character of its special technical and scientific articles, it will also have rare remembrance strength and long retainment as an AES reference source and memento of AES's GOLDEN ANNIVERSARY by the character of its institutional and historical contents, including the "Kaleidoscope of AES's First Half-Century."

BECAUSE of the GOLDEN JUBILEE ISSUE's planned sizable editorial stature, PLATING's blueprint of that issue, at this stage, allows for only 150 pages of company product and institutional advertising, much of which has already been spoken for by PLATING MAGAZINE's regular contract advertisers. There is no price increase for advertising in that issue. PLATING's current space rates (Rate Card No. 9), lowest among magazines in this field for largest paid circulation apply to wit on a one-time basis:

1 page	$270	1/2 page	$155
2/3 page	250	1/3 page	150
1/2 page (Is)	220	1/4 page	80
1/8 page	$60		

Extra charge for color and/or bleed.

Available special positions are charged extra.

ALL text and plates for advertising accepted and contracted to appear in the GOLDEN JUBILEE ISSUE must be in the hands of PLATING's Production Manager on or before April 15, 1959.

IF YOU are among the many companies interested in reaching the vast purchasing power of the electroplating and metal finishing industry through product or institutional advertisement(s) in this unique feature edition, you are earnestly invited and urged to fill out the below advertising reservation ticket, and mail it NOW to Golden Jubilee Issue Section, PLATING MAGAZINE, 443-445 Broad Street, Newark 2, N. J.

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M-1

TRADE LITERATURE

L—306. Immersion Heaters—N. J. Thermex Co., Inc. has issued a six-page bulletin featuring information on their steel, stainless steel and translucent fused quartz immersion heaters. Properties of the heaters are listed and applications designated. The catalog is illustrated with the various available models.

L—307. Copper Terminology—A lexicon to untangle the complex terminology applied to brass mill products, is now available in handy booklet form. The American Brass Co. announces publication of a 24-page, illustrated, "Copper & Copper Alloy Metalexicon."

The booklet provides the definitions to such terms as deoxidized, flat wire, patent leveling, season cracking, resquared metal, elongation, yield strength, etc.

L—308. Finishing System—A new 12-page publication, A-659, emphasizes the importance of a complete finishing system with many illustrations, featuring typical custom installations already in operation in automotive, appliance and many other industrial plants.

Issued by R. C. Mahon Co., the publication provides ideas for improving or building new installations involving drying and baking of all kinds, dust, fume and fog control. It also covers such special equipment employed for curing rubber, glass bonding, coating welding rods, preassembly cylinder-head heating, etc.

L—309. Conversion Kit—Dresser Electric Co. offers complete catalog information on new, silicon conversion kits for plating rectifiers.

Kit prices for the popular rectifier models are given along with how-to-order information.

L—310. Nickel Plating—A new booklet entitled "Practical Answers to 40 Practical Questions About Nickel Plating" has just been issued by The International Nickel Company, Inc. The illustrated 24-page booklet was designed to answer, in a non-technical way, those questions which are most frequently asked of plating specialists. As such, it deals directly with problems of interest to platers, engineers, and equipment designers.

The questions and answers included in the booklet pertain to all phases of plating. Some deal with the physical and chemical properties of the coating itself, and with its machining, welding and forming possibilities. Plating techniques and various design factors important to quality plating are also discussed, as well as the many applications in which nickel coating has proved invaluable.

L—311. Protective Coatings—A completely revised four page bulletin on protective coatings has been released by the Carboline Co.

This bulletin gives a breakdown of the four classifications of corrosive conditions according to severity of exposure. Sketches of appropriate areas are shown in each grouping.

A chart enables selection of coatings according to service requirements. Physical properties as well as chemical resistance are shown in easy to read columns. Examples of typical recommendations serve as a guide to an understanding of generic types and standard products.

L—312. Dialysis System—The new Hi-Sep dialysis system introduced by Graver Water Conditioning Co. is described in bulletin WC-121, now available from the company. This is the first bulletin issued containing the important facts on this system that can treat acid liquors.

Covered in the bulletin are design, operation, applications and advantages of the Hi-Sep Dialyzer. Engineering drawings illustrate construction and operation. Also discussed are the reasons why the system provides high-rate separation and large-tonnage recovery.

L—313. Selective Plating—A Fact File consisting of four two-page reprints of articles dealing with specific applications of the Dalic Process of selective plating is now available.

The titles of these reprints are "Selective Plating—As Simple as Painting," "New Brush Plating Method Saves Time and Backtracking," "Selective Plating"—a Specialty Puttin'-on Tool" and "Brush Plating Extends Usefulness of the Electroplating Process in . . .".

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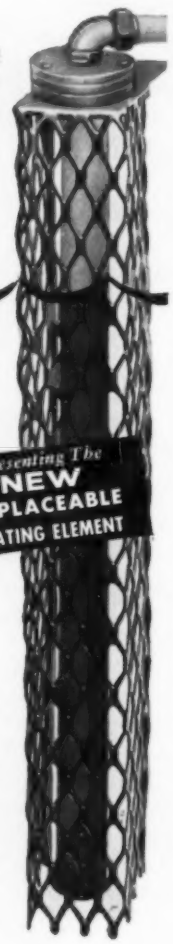

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PREVIEW OF FUTURE PLATING MAGAZINE ISSUES

APRIL 1959

RESEARCH ISSUE. A feature will be its documentary section embracing the AES's Research Program in American and Canadian universities and foundations, including an historical summary by Dr. William Blum plus a status report on current research projects by AES's current Vice Chairman for Research. Also other technical and scientific papers plus Golden Jubilee news and developments.

•

MAY 1959

PRE-GOLDEN JUBILEE CONVENTION. A larger than usual issue featuring both technical and scientific papers, together with important coverage of Golden Jubilee Convention, Exposition and International Conference news and data of broad readership importance.

•

JUNE 1959

GOLDEN JUBILEE. A unique feature issue climaxing the Fiftieth Anniversary observance of the American Electroplaters' Society, PLATING's parent, it will be targeted both for immediate interest to PLATING's global circulation and for long retainment as an AES reference source and as a memento of this year-long observance.

•

JULY 1959

POST-CONVENTION. An abundant issue carrying not only scientific, technical and practical plating papers and other educational data of substantial readership interest but also much exclusive post-GOLDEN JUBILEE Convention news and features.

•

AUGUST 1959

Another annual edition of PLATING's widely anticipated WATER AND WASTE TREATMENT issue.

•

NOVEMBER 1959

Third annual edition of PLATING MAGAZINE's popular AIRCRAFT ISSUE, this edition, judging by its blueprint at this stage, looms as one of PLATING's strongest future editions, a worthy follower of expectedly effective SEPTEMBER and OCTOBER 1959 general issues.

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Plating Progress

Sel-Rex

Published by SEL-REX CORPORATION

MARCH 1959 NUTLEY 10, NEW JERSEY No. 7

TIME-TESTED ACID GOLD PLATING PROCESS

Karatclad Wins Customers For Manufacturers Of Razors, Watchcases And Jewelry

Able to produce consistently uniform, high-fashion colors, the KARATCLAD Acid Gold Plating Process has been winning customers for over a year for some of the country's leading manufacturers of razors, watchcases, pens and costume jewelry. The process produces mirror-bright deposits, in any desired thickness, directly from the bath—*in the shade or color of your choice.*

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The KARATCLAD Acid Gold Plating Process is the only material which permits practical compliance with the new quality marking "Heavy Gold Electroplate," authorized by the Federal Trade Commission. The minimum 100 millionths thickness specified in the regulation, is produced in one continuous plating operation, with no scratch brushing, polishing or buffing.

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For a copy of the new Federal Trade Commission rulings, technical data and standard color descriptions on KARATCLAD Acid Gold, ask for FTC-G.

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- ☐ **FTC-G • KARATCLAD Acid Gold Plating Process for Decorative Applications and Copy of New FTC Ruling Covering Gold Plating—4 pages.**
- ☐ **HDX • Sel-Rex Hot Air Dryer — technical data sheet.**
- ☐ **AG-2 • Autronex Acid Gold Plating Process for Industrial Applications—3 pages.**
- ☐ **SX-o • Silvrex Bright Silver Plating Process —Technical Paper, 13 pages.**
- ☐ **PA-1 • Sel-Rex Plastic "Armor" Sprays, Paints, Dips, Thick Air-Dry Coatings. New product development bulletin—4 pages.**

Still Available . . .

- ☐ **RX-2 • Rhodium Electroplating Processes — 24 pages, demonstrations and charts.**
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- ☐ **BR-a • Gold Plating—Industrial and Decorative, 8 pages, illustrated.**
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- ☐ **PET-1 • PLATANEX, Reliable, low stress Platinum Plating for high temperature uses.**

NOTE: For your convenience, when requesting the literature you want, simply refer to it by the prefixed code.

New Hot Air Dryer Speeds Transistor Production

The new Sel-Rex Hot Air Dryer pictured below, has speeded up production in the manufacture of expensive transistor products in the plant of a leading manufacturer of electrical products for industry. The delicate transistors are lowered into the dryer

in a wire basket, after a postplating hot water rinse, and are removed in less than two minutes ready for packing. In addition to speeding up the drying operation, the Sel-Rex Hot Air Dryer eliminates the possibility of damage to delicate components, inherent in centrifugal-type dryers used in similar applications.

Constructed of #20 gage sheet steel, interior galvanized, with the exterior finished in grey enamel, the hot air dryer is equipped with a thermostat permitting temperatures as high as 250 degrees Fahr. Two-inch glass wool insulation keeps the exterior cool to the touch during operation.

Catalog sheet #HDX gives details.

New Slide Chart Tells Precious Metals Plating Costs At A Glance

The cost of precious metals plating per unit area to specified thicknesses, may be seen at a glance with the new Sel-Rex Precious Metals Data Chart. By simply setting the device to the price paid per troy ounce or gram, you read instantly the cost of plating Gold, Platinum, Silver, Rhodium, and various proprietary precious metals plating formulations.

The copyrighted slide chart also tells at a glance: Cathode Efficiency Data; milligrams per square inch and grams

per square foot of particular precious metals for .0001" deposit; recommended current densities and actual plating time in minutes for nine different precious metals plating formulations; and corresponding thicknesses, in millionths of an inch, of one milligram per square inch, and one gram per square foot, of the various precious metals.

Users of precious metals plating will save countless hours of tedious calculating with the Sel-Rex Precious Metals Data Chart, as well as minimizing the possibility of expensive errors in cost-estimating.

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PLASTISOLS AND ORGANOSOLS—

METAL COATINGS SUPREME

by L. D. MAINES*

INTRODUCTION

TODAY, THE APPLICATIONS OF HIGH-MOLECULAR WEIGHT vinyl chloride and vinyl chloride-vinyl acetate dispersion coating systems to metal have achieved prominence as efficient methods of corrosion protection. By suspending vinyl resin particles in a liquid medium rather than dissolving them it is possible to use the highest molecular weight, most chemically resistant vinyl chloride resins in metal coatings.

Although organosols and plastisols have been available to industry since 1943, widespread use of these materials did not take place until the early 1950's. At that time, one of the first fields to adopt plastisol coatings was the electroplating industry, which had been seeking a solution to the frequent recoating problems that resulted when conventional coating products were used. This use of dispersion resins has worked to such advantage that now the industry coats its plating racks almost exclusively with plastisols.

The first organosols and plastisols were often difficult to apply by conventional techniques. However, application methods, today, have progressed to a point where coating may be accomplished by either spray, dip, roller or knife. Similarly, early problems caused by high viscosity and dilatancy (resistance to movement) have been overcome by new resins and formulating methods. It is now possible to obtain vinyl dispersion coatings with viscosities ranging from a few hundred to several hundred-thousand centipoises. This latitude in viscosity and flow properties has led to the development of new end uses for both very thin and very thick coatings. Spray and roller films as thin as one mil or pressure gun coatings as thick as 0.375 inch are considered a standard coating thickness range.

The inherent flexibility of vinyl dispersion resins permits applications in thick films without the fear of embrittlement and cracking. Previously, oil-oxidizing and "bitumastic" coatings were deficient in these important respects. The thicker films possible with dispersion coatings offer coaters greater corrosion, impact, abrasion, chemical and water vapor resistance.

As a class, vinyl resins are insoluble in oil, grease, aliphatic hydrocarbons and alcohols. Even the lower molecular weight solution grade vinyl resins provide coatings of outstanding chemical resistance, as many of electroplaters and metal finishers have no doubt experienced. In addition, coatings based on solution-type resins have been used to protect ocean-going naval vessels, the locks, doors, and gates of dams, as linings for beer cans, and as coatings for a long and varied list of maintenance and product finishing applications.

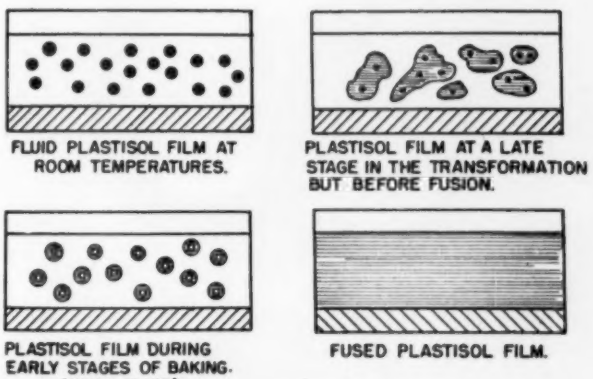
It is important, also, to note that the recent price reduction in resin raw materials brings the cost of organosols and plastisols well within the competitive range of conventional coatings. Considering that there is none, or in some cases only a small amount, of low cost volatile solvent required in a formulation, the cost per square foot per mil of thickness obtained with vinyl dispersion coatings is frequently lower than the cost of conventional oleoresinous coatings.

Plastisols and organosols are the two groups of dispersion resin coatings. Plastisols are those which do not contain any volatile solvents. They are preferred for coatings where maximum thickness is desired. The particular advantages of plastisols are:

1. Freedom from objectionable volatiles. This minimizes one major flammability hazard.
2. Application at 100 per cent solids content for maximum film build.
3. Excellent flexibility of films.
4. Tough films of high impact resistance and great tensile strength are possible.
5. Formulation of coating requires only simple equipment.

Organosols usually contain from 5 to 60 per cent volatile

PLASTISOL TRANSFORMATION DIAGRAM


FLUID PLASTISOL FILM AT ROOM TEMPERATURES.
PLASTISOL FILM AT A LATE STAGE IN THE TRANSFORMATION BUT BEFORE FUSION.
PLASTISOL FILM DURING EARLY STAGES OF BAKING. (STILL FLUID)
FUSED PLASTISOL FILM.

*Technical Representative, Union Carbide Plastics Company, Division of Union Carbide Corporation, New York, N. Y.

thinner. These coatings are used where films of lower viscosity are desired. The chief advantages of organosols are:

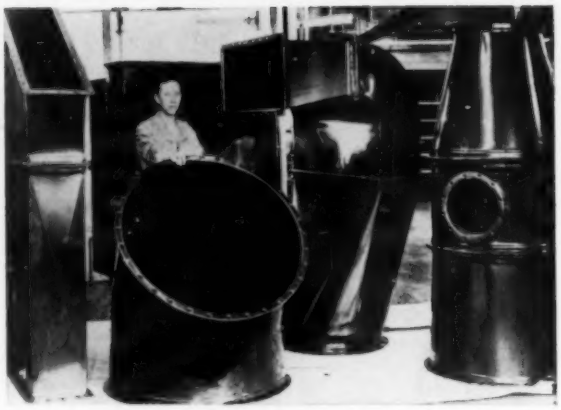
1. A greater range of film hardness is possible.
2. Easier handling with conventional spray applications due to lower viscosity.
3. Lower viscosities permit higher pigmentation and greater range of possible modifiers.
4. Thinner films may be produced than are possible with plastisols.
5. Film flexibility may be varied over a considerable range.

The actual "work horse" of these systems is a very finely powdered vinyl resin (usually one to two microns in size) which is dispersed and partially swollen or solvated in the plasticizer to give a system composed of completely suspended resin particles in a liquid medium. In the case of organosols, the fluid medium also contains the volatile diluent. This thinner is used to reduce viscosity. The suspension of swollen resin particles is applied over a primed metal surface. Then, the coating is baked to heat fuse the particles into a homogeneous mass. Usually, the fusion process requires a working temperature of at least 325 F to insure complete softening and subsequent fusion of the particles. The fusion process is rapid, almost instantaneous, when the melt or softening point of the swollen resin is reached. In convection ovens, ambient temperatures of 400 F are generally used to assure the sufficient extra heat to compensate for heating the base metal part.

COMPOSITION

While many possible formulas are in actual use, typical plastisol and organosol compositions would include:

This motor coil lasts longer because it is insulated with a tough, abrasion resistant plastisol coating, based on vinyl resins. The fast, economical application was accomplished by a dip-coating process by which the coil is immersed in the plastisol solution. Curing is accomplished by a short oven bake at moderate temperatures.



Plastisol coatings protect the basic metal structure of large metal hoods and ducts—parts of exhaust systems—from corrosive liquids and fumes. Because of the flexibility of vinyl plastisols, oven equipment with intricate contours can be successfully coated by dipping or spraying techniques.

Plastisol:	vinyl dispersion resin*	60 parts
	di 2 ethylhexyl phthalate plasticizer	40 parts
	Stabilizer	3 parts
Organosol:	vinyl dispersion resin*	60 parts
	di 2 ethylhexyl phthalate plasticizer	24 parts
	Thinner	16 parts
	Stabilizer	3 parts

Coatings based on these formulations may be clear or pigmented. Naturally the pigment selected must be durable and as chemically resistant as the base resin to insure that the coating will afford maximum protection.

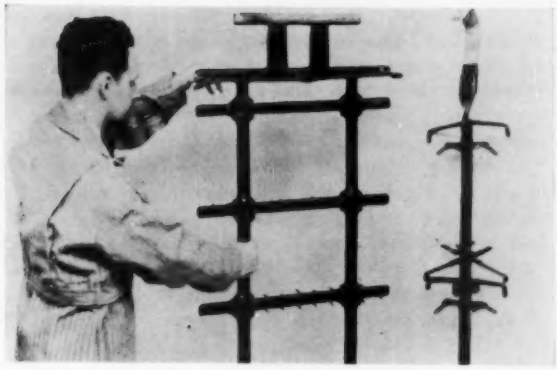
PROPERTIES

Properly formulated plastisols have been used commercially to resist the following corrosive products, which form only a partial list: concentrated phosphoric acid, magnesium flurosilicate, (concrete hardener), detergent concentrates, 85 per cent lactic acid, acid dyes, alkali cleaners, (16 ounces of caustic soda per gallon), chromium plating bath (32 to 40 ounces of chromic acid per gallon), nickel plating bath (35 to 45 ounces nickel chloride per gallon), and copper plating bath (3 to 4 ounces each of both copper and sodium cyanide per gallon).

In finished coatings tensile strength up to 3500 lb/sq in. and elongation up to 500 per cent may be obtained through proper formulation. Exposure to water vapor condensation at 120 F for two and one-half years has been completed satisfactorily with no failure.

A sandblast test dramatically proved the toughness and abrasion resistance offered by these vinyl dispersion coatings. Sixty passes with the nozzle of a sandblaster succeeded in only roughing the surface of an organosol coating. However, a coating of the same thickness based on a baked alkyd enamel vehicle, wore through after just 30 passes. In addition, Durometer† hardener values ranging from 30 to 90 are possible with changes in formulation.

* Bakelite QYNV
† Shore Instrument and Mfg. Co., Inc.



Plastisol coatings, based on vinyl resins, applied to these plating racks, contribute to longer life because of the chemical and heat resistance they offer. The smoother finish permits rapid draining of the surface. Flexibility, durability, resistance to chemicals and excellent electrical properties are other features.

ECONOMIES

Vinyl dispersion coatings make definite savings possible. For example, since there is no need to use volatile thinners in large quantities, no solvent recovery system is necessary. In addition, the thermoplastic nature of organosols and plastisols permits patching—damage caused by cuts, rips and tears may be repaired in the field using a simple blow torch form of heat source. When dispersion coatings without organic liquid solvents are used, much of the hazard of fire is eliminated. This also means that the cost of fire insurance may be sharply reduced.

Although the initial cost per gallon of a plastisol may be somewhat higher than the cost of a conventional oleoresinous product, there are more pounds of useable coating per gallon. This provides more square feet of the coating at equivalent film thickness. Also, there is no appreciable shrinkage that would produce thinner than desired sections. Still another advantage is that plastisol compounds tend to blend slightly during the prefusion process and fill in voids or bridge openings that may have been overlooked during application.

Still another economy is the greater life expectancy of a properly formulated and applied vinyl dispersion resin system as compared to conventional films. With greater life expectancy, comes lower cost of upkeep and refinishing.

SURFACE METAL PREPARATION

Surface preparation of the base metal substrate is highly important if the maximum degree of corrosion protection is to be obtained. Thorough removal of all loose rust, scale, oil and grease must be accomplished to promote the best adhesion and protection.

Conventional chemical or metal preparation by shot blasting is frequently performed. Where the corrosion problem is extreme, it is sometimes necessary to use a multi-stage cleaning and chemical pretreatment. In this preparation, a final rinsing is accomplished with de-ionized water to prevent residual salt corroding of the metal and subsequent loss of adhesion at elevated temperatures and high humidity.

Many good commercial primers are available. Usually primers based on phenolic and rubber, phenolic and epoxy resins or phenolic and vinyl solution grade resins are employed. The prime coat should be applied as quickly as possible after cleaning to minimize any surface oxidation and collection of humidity. Frequently, the heat used to give the coated metal part a thorough drying is also used to partially cure the prime coat. Primers are designed by manufacturers to provide adhesion of the plastisol. Formulations vary according to the conditions that will be encountered. Because of the differences in service requirements, manufacturers' recommendations for coating cure should be followed closely. This is important since resins of different classes usually require a specific cure for best results. A typical phenolic-epoxy primer formulation for example, requires a bake of approximately 20 minutes at 350 F.

COATING APPLICATIONS

Two of the most popular methods for applying vinyl dispersion coatings are dipping and spraying. In the former process, large industrial dip tanks are generally used. Tanks measuring 10 by 10 by 10 feet are typical for custom dip coating large articles. Spraying is accomplished by conventional pressure pot equipment or may be adjusted to work well with a newer system based upon electronic fields or the static principle of depositing coatings.

The viscosity properties of plastisol and organosol coatings should be controlled within a range that proves satisfactory for the individual application. This control will result in a uniform coating thickness and the desired properties of flow during the fusion cycle. It is frequently advantageous to preheat the primed metal or to apply the plastisol or organosol coatings immediately after the heat cycle used for priming. This will permit the coating to gel and provide

An example of effective product finishing is the plastisol coating, based on vinyl resins, applied to this kitchen cabinet shelf. The coating is permanently flexible, will not chip or crack, and is inert to household chemicals. In addition, shelves coated with plastisol supply a cushion-like effect for delicate dishes and glassware. The plastisol coating also resists abrasion and offers protection against the harmful effects of moisture, foods and beverages.

Graceful, practical garden furniture is one of many products enhanced by the beauty and protection of organosol coatings. These films provide a long-lasting, mar-, scratch- and abrasion-resistant surface that will bear up under the hardest wear. Organosol also proves its value as a finish for metal office furniture, school and industrial lockers, and for automobile dashboards.

heavy film build. Typical plastisols show gelation tendencies in the temperature area above 160 F. Film thicknesses of 60 mils and more per coat are typical when controlled by this factor in combination with the control of the compound viscosity.

CASE HISTORIES

The following illustrations will demonstrate some of the typical applications where organosol and plastisol coatings have been successfully used to provide maximum corrosion protection. For example, mentioned earlier in this discussion was the use of vinyl dispersion coatings by the electroplating industry. The plastisol coating on plating racks resists both acid and alkali solutions commonly used in the plating process. It also protects against the attack of electrical forces which are used to deposit a base metal onto the substrate. Temperatures of 140 to 160 F are frequently encountered during plating. But, plastisol coatings withstand the heat while providing complete protection from the highly corrosive vapor atmosphere which results during production. Once applied, plastisols may be repaired by hot knifing or blow torch techniques. In effect, these methods re-fuse the ruptures or cuts so that the surface integrity is restored.

The interior tubs and baskets of dishwashers are also coated with plastisols. After considerable research and development, plastisols were chosen for this job because of their resistance to detergents and chlorine solutions at elevated temperatures. As an additional feature, plastisols offer cushioning qualities which minimize breakage of china and glassware.

Plastisols are used to prevent fumes and moisture vapor from corroding and rusting industrial blowers, duct work and air conditioning systems. It should be noted that the fluid nature of the original plastisol compound has conformed to the irregular shapes and flows completely around any openings for full protection. This is a definite improvement over the type of protection achieved with cemented films.

A recently developed production operation has led to the application of plastisols to steel sheets prior to shaping the final piece. This permits factory precoating to take place at minimum cost. The plastisol coated steel sheet may then be formed and embossed into any shape or finished product within the limits of standard forming dies. Here, again, versatile plastisol and organosol coatings have sufficient tensile and elongation strength, even after aging, to provide protective and decorative coatings.

Open mesh screens and baskets may be completely coated by dipping or spraying with plastisols or organosols. Screens for the bottom of plating tanks, tote baskets, wire shelving for kitchen cabinets, filter press plates, coatings for outdoor furniture and motor coils, and as product finishes on home movie screens, for example, are typical places where plastisols and organosols have performed satisfactorily to minimize corrosion.

Because of the high film thicknesses offered by plastisols, they are used as gaskets in service areas where corrosion and oxidation would preclude the use of rubber. For several years, automobile manufacturers have employed a plastisol gasket in the drip rail or rain gutter of motor cars. Plastisol was chosen here for its resistance to ozone, absence of shrinkage, minimum embrittlement, and economy. It should protect the body weldments throughout the life of an automobile.

Tank linings are still another major use for organosol and plastisol coatings. Tanks and prefabricated tank parts manufactured in individual sections, may also be plastisol coated to give top-flight performance under the rigors of acids and alkalies.

CONCLUSION

The future of organosols and plastisols promises additional benefits for coaters. The results of development and research should make possible, in the near future, direct adhesion of vinyl plastisols to metal, providing excellent corrosion protection without the need for a primer. Additional laboratory effort is being directed toward lowering the temperature required to completely fuse the vinyl dispersion resin particles. This lower temperature should mean savings in heat energy and production time.

ACKNOWLEDGEMENTS

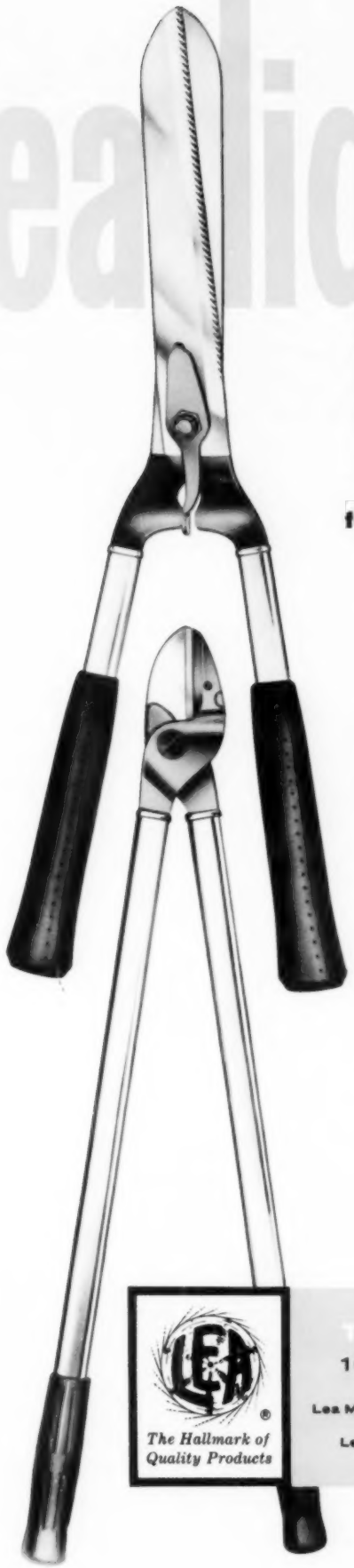
The cooperation of the following suppliers of plastisol and organosol coatings is acknowledged in the preparation of this paper: J. L. Armitage and Company, Inc., Newark, N. J.; Metal and Thermit Corp., Rahway, N. J.; Michigan Chrome and Chemical Co.; Detroit, Michigan.

Lewis D. Maines with more than 21 years of experience selling surface coatings resins at Bakelite Company, now serves the formulating needs of the West Coast. Operating from the company's Los Angeles sales office, he is in charge of a territory that includes Southern California and the states of Utah, Arizona and New Mexico.

Mr. Maines, "Don" as he is known in organic coating field, came to Bakelite in 1936 as a lab assistant at the Bloomfield Development Laboratories. In this capacity, he worked with phenolic varnishes and pigmented coatings and helped to develop aircraft primers to meet wartime Government specifications. In 1945, he transferred to the sales department, on special assignment, concentrating on the market development of phenolic resins as a base for furniture finishes. This work lasted for four years, at which time he became a technical representative in Chicago. In 1953, he operated from the Detroit office, where he remained until he took charge in Los Angeles last year.

Born in High Bridge, New Jersey, Mr. Maines received his BS degree in chemical engineering from the Newark College of Engineering. He is a member of both the Los Angeles Paint and Varnish Production Club and the Los Angeles affiliate of the National Paint, Varnish and Lacquer Association.

INDICATE B 301. ➤



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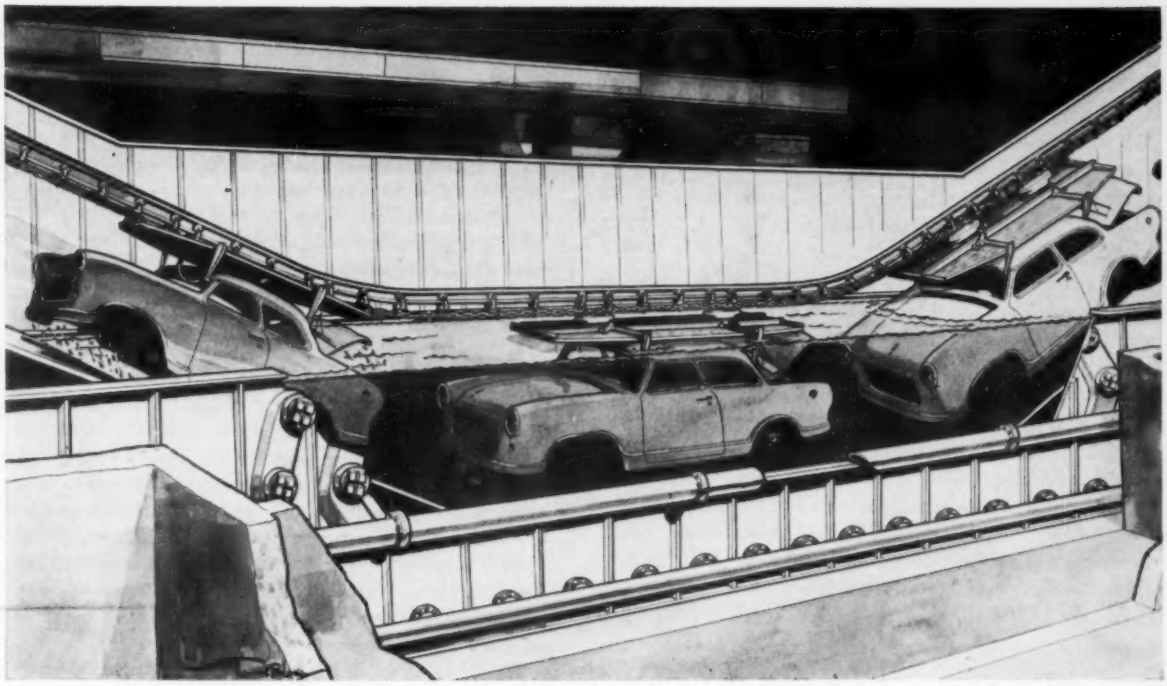

Schematic drawing showing operational details of the 50-foot long automobile full body dip tank of American Motors Corporation

THE FULL BODY DIP SYSTEM AT AMERICAN MOTORS

by VENE W. WESTFALL*

FACED WITH THE PROBLEM of controlling corrosion, which seemed aggravated more and more as each model year progressed, the American Motors Corporation management authorized the formation of a committee to control this costly damage and source of customer dissatisfaction. The corrosion control committee represented management phases of plant engineering, manufacturing, product engineering, laboratory personnel and quality control and inspection. Meetings were held monthly and were fruitful in controlling as far as possible the failure of body parts due to corrosion by the then currently accepted practices of spraying underbodies, insides of sills and under fender joints with rust inhibiting paint materials, and by application of corrosion proofing weld-through sealers prior to body assembly. These methods at best left far too many areas bare of any corrosion resistant material and exposed to the ravages of rust, destroying ultimate quality and resale or "used-car-lot" value of the automobile.

From this committee was germinated the idea of dipping the underbody or certain parts of the body in a paint-type corrosion control material. Subsequent discussions included consideration of the then active English production method called "roto-dip" and other types of dip and flo-coat operations and out of all of these discussion meetings came a top-

* Superintendent, Paint Division American Motors Corporation, Kenosha, Wisconsin

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level management statement as simple as "Why not dip the body all the way under the paint?"

The philosophy of the thinking of the committee during the following several meetings was predicated on the idea that the entire automobile body should be completely submerged in some form of a rust inhibiting paint type primer.

At this time and with full management approval several phases of committee investigation began.

The personnel of the Detroit paint laboratory after thorough and exhaustive testing of various types of materials recommended an alkyd resin primer system, red oxide in nature and zinc-chromate fortified*. Standards and cost estimating departments of both the Kenosha and Milwaukee operations started comparative investigations as to the nature of the costs such a move would involve.

National industry experience in a production body dip system was not only sparse, it was completely lacking, so at this point it was necessary to learn what "Why not dip the body all the way under the paint?" really would entail. Production asked for an experimental tank simulating production facilities as closely as possible.

Ultimately a tank large enough to admit a completely assembled Rambler body was filled with 7000 gallons of the approved material. Hoists were placed properly, the tank was housed with a solvent control chamber, temperature controls were installed and the investigation process involving the actual dipping of bodies was begun, early in January of 1957.

For the next several months, literally dozens of bodies were dipped in various attitudes and under various physical circumstances and all results were carefully recorded and evaluated. During this phase of the investigative program, the following sets of variables were studied and ideas formulated for their ultimate control:

1. Temperature of atmosphere surrounding the tank area and body.
2. Temperature of the paint dip material.
3. Effect of air movement surrounding the dipped body.
4. Effect of concentration of volatile solvent in the atmosphere over the tank and surrounding the body.
5. Angle of the body during the drain-off period.
6. Times of the drain-off at various angles or attitudes.
7. Solvent balance of the dip material.
8. Optimum viscosity range under varying atmospheric differences.
9. Carry-out of paint material and paint usage.
10. Ultimate tank stability of paint material.
11. Effect of positioning body parts such as doors, decklids, tail-gates, etc.
12. Locating of drain holes and proposed body changes.
13. Location of run-off and sag areas and their proposed rework extent.
14. Film thickness and resultant primer quality under varying sets of circumstances.
15. Air trap areas and resultant continuance of film quality for complete corrosion control.

These tests were conducted by production personnel of both the Milwaukee and Kenosha plants in cooperation with the plant engineering departments of both plants in order to ascertain the advisability of proceeding with the ultimate production installation and to anticipate the problems which might arise out of the full body dip system, as it was later to be called.

It was not long after the beginning of this phase of the investigative program that a new and additional idea came to light to alter the philosophy of the committee thinking. It was now felt that not only could the initial mission of a full body dip system be completed—the complete control of corrosion—but also, the prime spray operations could be eliminated and the dip system would not only apply a layer of corrosion proofing material in all of the heretofore inaccessible members of the body, but provide a prime film of such quality and homogeneous film build so as to eliminate any later prime spray operations. It was believed that by carefully controlling as many of the variables as possible, the result would be an absolute control of the primary mission and cost reduction in the primer application.

In the early summer of 1957, production representatives officially recommended to the corrosion control committee that the full body dip method of prime and corrosion control should be undertaken. Plant engineers were instructed to layout the operation for both plants with full management approval.

Because of physical differences between the two manufacturing plants (Kenosha and Milwaukee), separate systems were designed for each and as the experience of this writer from this point on was almost entirely with the Kenosha operation, this discussion shall be concerned with that operation.

Physically, the deep-dip body prime system is an entirely enclosed, almost completely automatic unit. From the time the body, carried on its multipurpose monorail hung carrier, enters the first or washing stage of the chemical surface treatment system, it is entirely enclosed and remains so throughout the vestibule and the dry off oven, down through the inclined cooling tunnel and into the dip tank itself, as it is submerged in the material and starts up through the drip-off tunnel, goes into the transfer vestibule where it is automatically transferred from the carrier to a body truck, through the old prime spray booth for some minor rework, into the gas fired prime baking oven, and finally as it emerges onto the sanding deck. Also, except for the small amount of rework (discussed later) done in what used to be the prime spray booth, the operation is automatic and is entirely unattended. A total of 55 bodies are enclosed in the entire system at the same time.

The dip tank itself and its surrounding structure is enclosed in a large fire-proofed room at and below the ground level. This is to obtain the necessary drip-off angle, after the dip, on the body's return to the paint department for refinishing.

The eight-foot wide by seven-foot deep by 50-foot long dip

*Product of Pittsburg Plate Glass—Paint Division.

tank, tapered upward on either end, normally holds over 12,000 gallons of the dip primer. This tank rests directly atop the emergency dump tank of 18,000-gallon capacity which is completely grouted in as an operating pit for the pumps and other equipment. In this pit are the circulating pumps, two each rated at 5 hp and capable of 350 gal/min pumping capacity each. These can be used in the circulating system either separately or together. Also in the pit are sump pumps to dry the pit if necessary, the required safety equipment and the bulk of the circulating piping. Inside the dip room are the filters, necessary instrumentation, solvent housing over the tank and control panel for the tank and production line operation. Each of these will be discussed in more detail. The entire system from start to finish is as follows:

1. Chemical Surface Treatment

The equipment consisted of a standard six-stage washing machine and zinc phosphating unit that needed no altering to adapt itself to the deep dip method. At a later date a large "pre-washer" was installed ahead of the spray washer of the chemical surface treatment system. It is an extremely high volume, low velocity washer of a combination dip and flood (spray) type designed to remove dirt from the inside of the body and body members in sills, floor pans, etc. The washer was added when such dirt became a production problem.

2. Vestibule and Dry-Off Oven

Also a standard installation, the only change is one of method of operation—not of physical layout. The change manifested itself in control of heat to dry. It is necessary to guard against overheating the body members so that the temperature of the body steel entering the dip tank later will be as low as possible. This is accomplished without the carryover to the tank of any residual waters from the chemical surface treatment system.

3. Cooling Tunnel

Actually, the cooling tunnel is an extension of the enclosure down to the dip tank enclosure one and one-half stories below. Some air control is carried on in this enclosure to attempt to dissipate some of the heat in the sheet metal of the body carried out of the chemical surface treatment dry-off oven. The ideal dipping temperature seems to be in the neighborhood of 85 to 90 F.

4. Tank Enclosure

A spray booth type enclosure is directly over the surface of the dip tank designed to control air movement of exhaust and supply air, concentration of solvent in the atmosphere and provide some stability of humidity and air temperature all in a clean, dust free system.

5. Drip-Off Tunnel

The drip-off tunnel is the same type of structure that houses the wet dripping body, under close air movement control in a clean atmosphere with some control of temperature, humidity and solvent balance.

This area is inclined at exactly 30° from the horizontal, which appears to be the optimum drip-off angle for sag free quality, reduced carry-out and optimum film build. This tunnel, like those preceding and following, is closely dampered to aid in flashing the film quickly if necessary, or conversely, restricting air movement to keep the film open for as long as necessary.

6. Transfer Vestibule

Still an enclosed and controlled area in which the body is automatically released from its carrier which will hold either the sedan or the station wagon body by the top of the windshield and rear window openings, and is deposited automatically on the body truck where it is moved by floor conveyor throughout the rest of the finishing operations.

7. The Rework Area: Formerly the Prime Spray Booth

This area is used now as an extension of the drip-off tunnel and is a perfect area for any necessary rework. In our installation we find it advisable to solvent wash the lower deck center panel on all body types to eliminate the sanding of the heavily sagged condition in that area. Also, some small amount of solvent is sprayed in each door lock mechanism preventing it from sizeing because of the penetration of the prime material and the subsequent baking operation.

DIP TANK ROOM

Now to return to the dip tank room itself for a complete description of the tank and its component parts. The following should present a rather complete picture of the operation of the various units:

1. Paint Circulation and Filtration

The circulation of the dipping material and its consequential filtering and mixing are accomplished hydrostatically and energized by the described circulating pumps. Paint is removed from the surface of the tank through what amounts to a skimming operation by overflow ports placed at close intervals around the sides and at both ends of the tank. The paint falls by gravity down collecting tubes into a common header along both sides to a 4000-gallon "pre-mix" tank, separate from and below the level of the large main dip tank.

The material in this "pre-mix" tank passes through two separated 0.25-inch mesh screens to remove any large foreign objects which may have entered the system and passes them over the plate-type heat exchanger which takes up the bulk of the "pre-mix" tank, then it passes down to the circulating pumps. From the pumps the paint material passes to and through a filter* of conventional disc type in which the rotating direction is automatically reversed at short intervals to avoid blade build-up, and then passes into two separate full flow type filters† with wound yarn type filter media filtering 50–75 μ particle size.

The filtered paint enters the bottom and bottom edges of the tank through 36 ports allowing a high volume, low velocity flow. These influent ports are shielded to deflect the material in a plotted course along the bottom surface of the tank to "scrub" the bottom surface and combat any settling of paint or pigment material which may occur.

2. Level Control

The level of the paint material in the dip tank is constant

* Cuno filter, model MSV-1.
† Model WR71D-10-6FG2A.

View inside of the cooling tunnel looking down into the tank. The work is moving away from the camera, showing the rear of the automobile body with the trunk lid raised.

because of its overflow circulating system as long as the material used in the dipping process is replaced. The replacement of material is governed by a liquid level control* with the high and low limits automatically controlling a solenoid in the circulating line to the paint mix room. The function of this device is to maintain the level in the "pre-mix" tank between certain pre-set limits. This automatically pumps paint of pre-adjusted viscosity from the paint mix room when the lower limit is reached and shuts off the pumping operation of fresh material when the high limit is reached. It is only manually necessary to refill and adjust the viscosity of virgin material in the storage tanks located in another part of the body shop in the paint-mix room or paint kitchen which serves all of the finishing operations. It is necessary that these tanks be maintained and full so that the material is available when the control calls for it.

3. Temperature Control of the Paint Material

The temperature of the material is kept automatically in an optimum operating range which has proven to be 85–90 F. There have been rare occasions which have necessitated altering the temperature to accomplish some quick control but for the most part it has been held constant.

Material temperature is recorded on another thermal unit* and is connected by air to a three-way valve.† When the upper limit of the control is reached, the valve passes cold water through the heat exchanger. When in the lower limit of the range, steam will pass through the other position of the valve and warm the paint passing over the heat exchanger. During the time the paint is in the operating range both the cooling and the warming media are shut off. This rather simple apparatus has proven very capable of doing the job for which it was designed and even some rather extremes as experienced by our Wisconsin weather have failed to force the material outside of its operating limits.

4. Solvent Concentration

The concentration of solvent in the housed atmosphere above the dip tank and in the drip-off tunnel is recorded on a vapor analyzer.* Air samples are automatically taken at one minute intervals from a point in the dip housing above the tank, from another point in the drip-off tunnel and still another place in the lowest part of the pumping pit. These samples are compared by the machine with a sample of fresh outside air and recorded on a moving tape in concentration of the volatile solvent 0.01 per cent.

This instrument serves a multiple purpose. First, it functions for the benefit of the American Motors plant in Kenosha in compliance with various local, county and state fire and safety regulations and insurance requirements. Secondly, it is directly connected to the carbon-dioxide fire extinguisher system† and this phase will be discussed later. Third, it is a tool for the use of production in that the concentration of atmospheric solvent has a direct effect on ultimate quality—film thickness and sags or run-offs—this concentration can be quickly varied within the limits allowed by law by altering either the material temperature or the movement of supply or exhaust air volume.

5. Air Supply and Exhaust

The air supply and exhaust systems are fairly standard for spray booth operations except for some slight modifications resulting in a much more flexible and close control.

Each of the separate zones has its own air supply and exhaust system. Also, the air supply and exhaust enter and leave the tunnels through individual dampered openings one foot square spaced four feet apart on both sides of the tunnels. These dampers are controlled by quadrants outside the structure of the tunnels and any one or group of dampers may be set at any angle—from completely closed to completely open—to achieve any air flow characteristic desirable to control the resultant dipped film.

6. Viscosity Control

The original plans for the installation provided for the addition of an automatic viscometer to control the viscosity of the paint material and automatically add solvent when necessary. This however has been shown to be an unnecessary expense. It was discovered early that if the paint material is controlled to viscosity as it is initially replaced in the system by the mix-room operator, it remains quite stable. This follows the reasoning that this large quantity of paint is a very stable entity and is not very apt to fluctuate in viscosity under normal circumstances to any great extent.

Taps have been placed in various horizontal levels of the tank so that samples can be removed to check the effectiveness of the circulating system as a key to viscosity layering sometimes evident in large tanks which may in turn indicate sedimentation or fallout of pigment material due to insuffi-

* Product of Minneapolis-Honeywell.
† Product of Moore Products Co.-Honeywell.

* Product of Honeywell-Davis.
† Cardox System.

cient circulation. Viscosity is checked both with the number four and the number seven Ford cup.

7. Fire and Safety Control

It goes without saying that everything that can possibly be done to make and keep this installation safe has been and is being done. Extensive training programs directed toward all phases of production, maintenance, plant protection and to materials handling personnel involved in the operation of the departments surrounding the dip tank area are continually in process.

If ever needed, fire control would be accomplished by a carbon-dioxide system* flooding the dip tank enclosure, the tunnels and the pit area. It can be set off automatically by a rapid rise in temperature at any point along the line, by the increase of the concentration of solvent in the atmosphere above safe limits, or by the manipulation of many manual controls placed at opportune points throughout the system and the surrounding departments. The system is also interconnected with the dumping mechanism and if it should be placed or forced into operation, the automatic dump valves drop the entire 12,000 gallons of paint material into the protected dump tank below it in less than four minutes.

There is also, throughout the entire system, a standard piped water sprinkler fire suppression system.

8. Production Control

All production controls relating to production, supply and exhaust fans, testing equipment operation, pumps, filters, etc., and all of the safety controls and line controls are centrally located on a common operating panel, well identified and under the control of salaried production supervisors only.

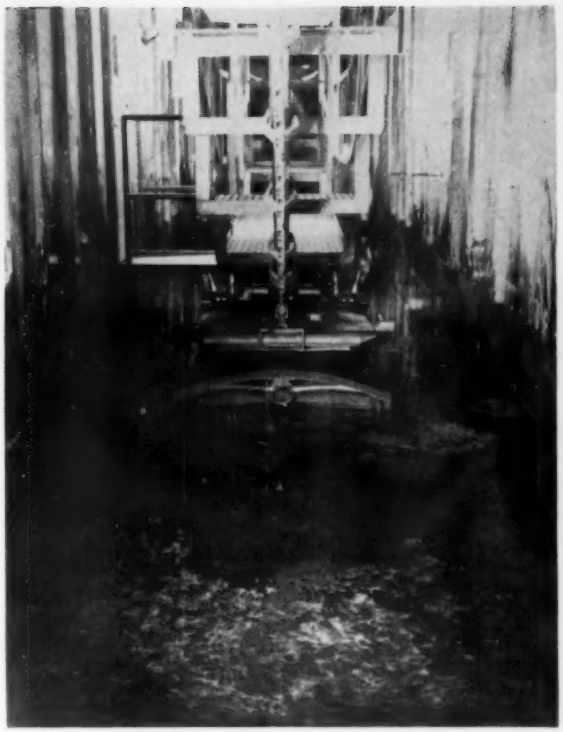
Such was the nature of the installation when on February 5, 1958, the welders cut the crossover on the monorail and hooked together the monorail conveyor so that from this point onward the bodies proceeded down the cooling tunnel and into the dip tank. Here was the answer to "Why don't we dip the body all the way under the paint?"

PROBLEMS AND SOLUTIONS

1. Dirt

Dirt is, was and will always be the major problem facing a full body dip operation. In particular, dirt consisting of welding slag, grinding dust and all of the organic and metallic dirt endemic to metal finishing operations in an automobile body plant, which is introduced to the dip material by the bodies entering the tank. It is the type of dirt particle that lodges in the seams and crevices of the body and box channels of the floor members that are not removed during the conventional spray wash connected with the chemical surface treatment. These particles of dirt appear to actually float out of their lodging during the dipping process and redeposit themselves on and in the paint film during the withdrawal from the tank. They gravitate to the tank at a faster rate during the production day than the circulating and filtering system can remove them. Control of dirt has been the object of our most concentrated efforts and has resulted in the following progressive controls.

Circulating and pumping rates in the tank have been revised both during production and non-production periods. All of the parts that are assembled in the unitized body are washed prior to their assembly. The body is thoroughly vacuumed before its departure from the framing departments. And, most recently, the pre-wash described earlier has been added to the operation.



This picture was taken a few seconds after the picture on the opposite page. The body is almost entirely submerged.

Even some of the sealing and sound deadening operations were changed when it was discovered that the dip material attacked the sealers and sloughed off particles of asbestos fiber contained in the sealers. These particles of asbestos made the ultimate sanding and enamel preparation operations an almost herculean task.

By these many controls the dirt in the prime film is diminished, but the controls have to be constantly policed. At this point it appears that dirt will be the most serious objection to any proposed full body dip system.

2. Sags and Runoffs

Paint sags from dipping have three principal causes:

(a) The physical conformation of the body.

(b) Trapped, floating, or released air bubbles.

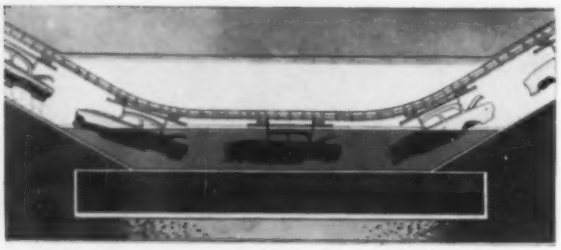
(c) Larger particles of dirt or foreign matter.

Sags caused by the physical conformation of the body can be controlled to a very large extent by altering one or more of the many variables governing the formation of the film, or by altering the shape of some small part of the body itself.

An insignificant change, unnoticed by the customer, can radically improve the dipped film, for example:

A long and troublesome sag (worst on the body) was formed by the run-off from the drip rail of the sedan body and caused some great amount of rework and a large low quality cut through area on the side of the rear quarter of the body. The physical layout of the end of the drip rail areas were studied. It was found that by shortening the length of the

* Cardox.



The system operates at the rate of one car per minute.

end of the drip rail by one-eighth of an inch and altering the cut-off angle by about 20° off perpendicular to the roof extension, the sag was entirely eliminated. One area, the lower deck center panel, as heretofore mentioned, did not lend itself to any remedial treatment and it is being washed with solvent so as not to harm the chemical surface treatment and spray reprimed.

Sags caused by air bubbles or escaping trapped air during the dip process are formed by the bubble of air at the point at which it bursts and deposits an excess of paint carried by the bubble in a runoff.

For example, when the first body emerged from the transfer area the roof was so badly sagged as to render the baked film almost impossible to sand. This condition remained until the cause was discovered and a cure put into practice. The sags did not respond to any normal treatment such as viscosity control, air movement control or altering the solvent concentration. It was noticed that as the body started to rise out of the tank a large amount of air that was trapped under the roof emitted a number of bubbles which worked back over the roof and burst further up in the drip-off tunnel. The cure was simple and the "snorkel" or air relief tube was developed. The snorkel now is placed on every body going through the system to relieve the trapped air as the body enters the dip material and the roofs have been freed of sags.

Sags caused by the runoff surrounding larger particles of dirt were brought under control by the subsequent cleanliness programs started in the department.

These two areas are responsible for more than 90 per cent of any difficulties that may occur with the system. The remainder for the most part rely for their solutions on the functioning of sound production practices and basics of organic finishing techniques.

The loss of control of any one of the many variables in the system will be apparent immediately in the resultant film finish and it is simply a matter of re-establishing control to place the system in satisfactory operating order once again.

The last phase of control of the full body dip operation is its maintenance which, varying with production schedules, is pretty much routine.

The filter cartridges* are changed periodically as the filter pressure drops. When the pressure differential approaches 15 lb, the filter is cut out of the system by the valving and the cartridges are replaced.

It has been found advisable at regular intervals to drop the material out of the dip tank into the dump tank below, and completely wash and clean the dip tank proper. The dip material is then pumped from the lower dump tank back into the dip tank through the filter system. This whole process is done as a one (third) shift operation and does not interfere with the normal production schedule.

The bottom of the drip-off tunnel is lined with a heavy gauge plasti-coated paper as a drip surface to return dragged out material back to the tank through a filter screen. At tank cleanout time, this paper is disposed of and replaced. The same surfacing is done in the transfer tunnel and subsequent tunnels. The maintenance department increased its general clean up and janitorial services following the introduction of the full body dip system.

In conclusion, extensive testing and sectioning of bodies, checking of film thicknesses and corrosion resistance and general appearance and customer acceptance have proven the American Motors Corporation's full body dip system an extremely successful venture.

Success has been largely due to the cooperation of all phases of manufacturing and careful attention to detail through the developmental and planning stages. Without a unilateral purpose and adherence to the philosophy of the original idea as over the period of two years, the project would have faltered and never reached completion.

"Dipping the thing all the way under the paint" has come to mean just that. The procedure described, leaving nothing to chance, plus the application of all the basic production principles governing organic finishing were required to develop the full automobile body dip system at American Motors.

* Fulflo, manufactured by Commercial Filters Corporation, Melrose, Mass.

Vene Willard Westfall received a BS in chemistry and zoology from Michigan State University, and his MS from Wayne State University and Michigan State University in organic chemistry. After three years with the US Army Field Artillery and Infantry in the South Pacific Theatre, he joined the Chrysler Corporation in the capacity of paint engineer. He has been with American Motors Corporation since March 1956 and, at the age of 33, is superintendent of the Paint Division. Sports cars, engines and art are his hobbies.

SPRAY PAINTING WITH EMPHASIS ON AUTOMATION, HOT SPRAYING AND CATALYST SPRAYING

by H. A. NIEDHAMMER, P.E.*

SPRAY FINISHING HAS ADVANCED in tremendous strides over the last half decade. With ever increasing demands for greater production, there came the need for improved, more dependable spray guns up to and including the development of automatic machines. The requirements for excellent finishes on consumer and precision made industrial products led to the development of controlled temperature equipment. New coating materials, developed by the research chemists, have made it imperative that specially designed spray equipment be available for the industrial users. This equipment, which must be capable of spraying short pot-life mixtures of resins and catalysts, is in wide demand by manufacturers of fibre glass boats, acid resisting laboratory tables, thermal acoustical insulation employing ureathane foams and many other allied products.

METHODS OF FINISHING

Before getting into the details of the spray application of both organic and inorganic materials, it might be well to mention some of the most accepted means of finishing. These are:

1. *Dip Coat Method.* The object coated is submerged in a paint reservoir to provide full coverage.

2. *Brush Coat Method.* As the name implies, means to apply the paint by means of a hand brushing operation.

3. *Flo-Coating Method.* Paint is pumped through headers to nozzles which actually pour on paint, in predetermined patterns, to provide full coverage.

4. *Spraying Application.* This method may be any of the following:

   (a) Compressed air atomization. This is the process most widely known and employed in industry.

   (b) Airless Atomization. As the name implies, no compressed air whatsoever is used for atomizing the material sprayed. The desired break-up of paint particles is produced by employing high pressure and sometimes heat, to cause the material to be atomized.

   (c) Electrostatic application. This is just like the time when you ran a comb through your hair, and generated an electric charge. This charge enabled the comb to pick up small bits of paper. The electrostatic process employs a difference in electrical potential, between the article to be coated and the field in which the paint is atomized. The potential difference causes the paint to be attracted to the article to provide the desired coating. The paint can be atomized by either the standard spray methods, using low atomization air pressures plus controlled material temperatures, or by the whirling disc process which literally throws finely atomized paint into the electrical magnetic field.

COMPRESSED AIR SPRAY FINISHING EQUIPMENT

The spray painting method, employing compressed air as an atomizing medium originated with the birth of the medicinal atomizer approximately 70 years ago. Following the medicinal atomizer, in this evolution process, was the perfume atomizer, both of which remain an ever popular item today. Then around the year 1908, the first spray gun, as we know it, was developed for the furniture industry to apply fine varnish finishes. With the advent of nitrocellulos lacquers, in the early twenties, and later, the development of synthetic enamel type finishes, the spray guns really came into their own and have continued to improve as the field has grown. These materials, which, of necessity, had to be applied by the spray method, caused the elimination of the remaining bottle-

Fig. 1
Internal Mix Cap

Fig. 2
External Mix Cap

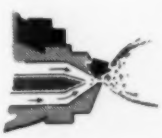


Fig. 3
Suction Feed Gun

* Regional Engineer, The DeVilbiss Company, Toledo, Ohio and Springfield, New Jersey.

Fig. 4. Touch-up Gun

Fig. 5. Light Industrial Work Gun

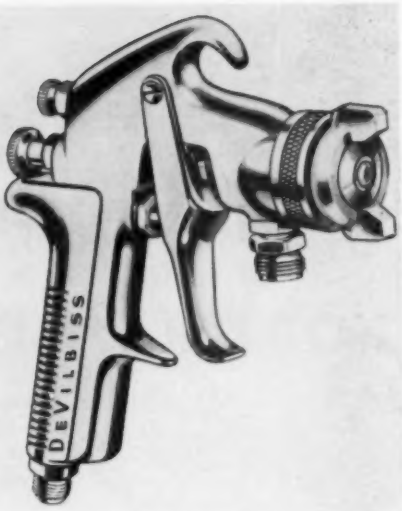


Fig. 6. High Production Gun

neck in automobile production and set this industry off on its path to undreamed of high production levels.

Continuous research in the spray equipment field has brought about the development of precision made atomization air caps and fluid passages or tips. These have produced the most desirable spray patterns for the products being coated, the material being sprayed, and the finish or end result desired. Basically, two types of air caps are employed. The internal mix type, Fig. 1, where the paint and the air mix inside the cap prior to atomization. The external mix type, Fig. 2, where the paint emerges from the fluid tip in front of the gun. Here the material is broken into fine particles by the force of the compressed air coming from the orifices precisely located in the face of the air cap.

The orifices in the cap, located around the center fluid passages, emit air which causes approximately 98 per cent of the atomization of the paint. The air from the "horns" of the cap produces the spray patterns, which may be anywhere from round to a fan type.

With a suction feed cap, paint is drawn from its reservoir by a suction process created by the inherent design of the cap and fluid tip relation. The vacuum created by the air flow over the fluid tip causes the material to flow as illustrated in Fig. 3. The use of suction feed equipment is limited by the ability of the vacuum created at the end of the fluid tip to draw material from the cup reservoir. In some cases, the rate of material flow may not be great enough to meet production requirements. In other instances, the viscosity and weight of material might be too great to permit the material to be drawn up to the gun by the suction principle.

Other types of external mix caps and all internal mix caps will function only if the material is delivered to the gun by means of an external source of pressure, usually compressed air acting on the material in a closed container. The material is delivered to the gun through a fluid hose, connected between the pressure tank and the gun.

The fluid passage or tip in the head of the spray gun is available in a variety of sizes anywhere from 0.18 to 0.50 in. I.D. The size of orifice employed is dependent upon the type and viscosity of material sprayed along with the desired flow rate of material. When the gun is triggered, the needle leaves its seat and the material flows through the fluid tip.

SPRAY GUNS

Various types of manually operated spray guns are available. Some typical models are illustrated by:

1. Fig. 4, which is for touch-up work.
2. Fig. 5, for light industrial work.
3. Fig. 6, used for high production use.

As production increased, it was evident that the automatic spray gun was necessary to produce the controlled coatings. This gun can repeat identical spraying actions for a countless number of times without requiring adjustments. This type of gun also employs the same basic components as the industrial

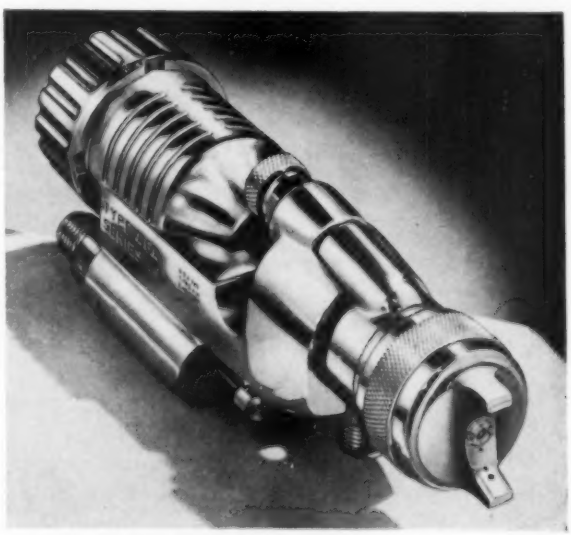


Fig. 7. Automatic Gun

type manual gun. The automatic spray gun, illustrated in Fig. 7, uses air caps and fluid tips, that are interchangeable with the manual gun. The major deviation from the hand gun is the substitution of an air piston instead of the hand trigger to operate the air and fluid valves. A typical automatic gun, can function as fast as four times a second or better. Remotely controlled air pressure, in the range of 40 to 50 psig, on the piston, triggers the gun. By exhausting the compressed air from the piston through a conventional three way air valve, the fluid and air flow through the gun is interrupted.

STEAM SPRAY

To digress a bit, let's go back to some of the specialized manual spray guns that are available to the industrial user. First of these, is the steam gun, Fig. 8, which, as the nomenclature describes, employs steam rather than compressed air, for atomization purposes. Design features include excellent insulation between the head of the gun and the handle and trigger which obviously must be kept relatively cool.

Furthermore, steam used for atomization, passes through the sprayhead of the gun. Normal viscosity paint passes through the handle, keeping it cool. The steam gun has found popularity in many industrial plants which have great quantities of steam available. This steam must be superheated to provide dry steam at about 425F. The required pressure is approximately 35 to 40 psig. One distinct advantage of using steam for atomization purposes is that it provides a temporary opaqueness immediately upon application, which acts as a built-in guide coat. This, in turn, helps assure adequate film build of material being applied.

CATALYST SPRAYING

The most recently developed gun for the finishing industry, is the catalyst gun for spraying finishes such as polyesters, urethane foams, epoxies, conversion varnishes, wash primers and the like. These are two component type of materials which produce improved finishes after a brief chemical reaction. The catalyst gun, in Fig. 9, is similar in appearance to the production manual gun with the exception it has two fluid inlet connections at the head of the gun. The catalyst or additive material enters at one connection and the resin at the second. The two materials come together externally after leaving the gun, mixing in front of the air cap. By adhering to this principle, the problem of short "pot-life" is eliminated.

To insure exacting mixture of catalyst and resin materials, there is available for industry, a complete catalyst spraying outfit, as illustrated in Fig. 10.

The air transformer, condenser and regulators are employed to provide clean air at desired controlled pressures for atomization. These provide accurate fluid flow control for both resin and catalyst materials. The resin is delivered to the gun from a pressure tank. The catalyst material is delivered from a second pressure tank, with stainless steel insert, through the flow meter to the gun. Briefly, the desired resin flow is first determined by a conventional means. The optimum spray pattern is selected and then, using the same pressure on the resin tank, unatomized paint is delivered through the gun, into a graduate. With this flow rate known, it is a matter of simple calculations to determine the catalyst flow rate. When employing the available predetermined flow meter chart, it is possible to obtain exact the flow meter reading to produce the end result desired.

Extremely high viscosity resin and catalyst materials will require the use of the catalyst type gun shown in Fig. 11. This gun handles quasi-prepolymer resins at mixtures up to a full 50:50 ratio. Since the viscosities are normally too high to be used with pressure feed tanks, positive displacement metering pumps are recommended to deliver both components at predetermined rates, to the gun.

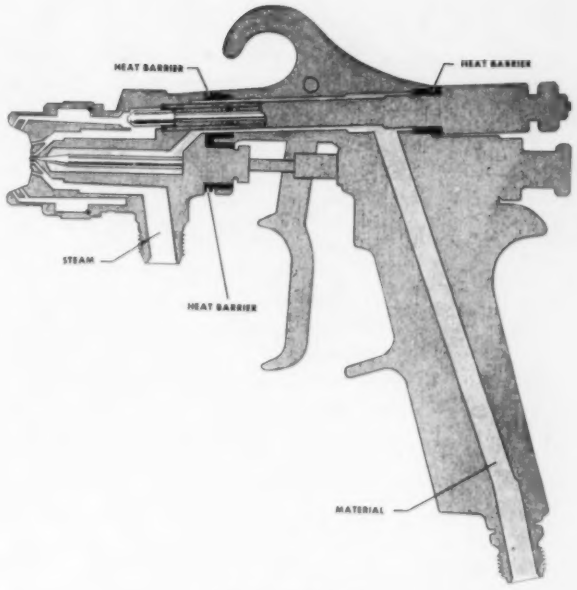


Fig. 8. Steam Gun

CONTROLLED TEMPERATURE, LOW PRESSURE APPLICATION

Since it is a known fact that it is much easier to atomize paints for spraying when the viscosity is reduced, considerable

Fig. 9. Catalyst Gun

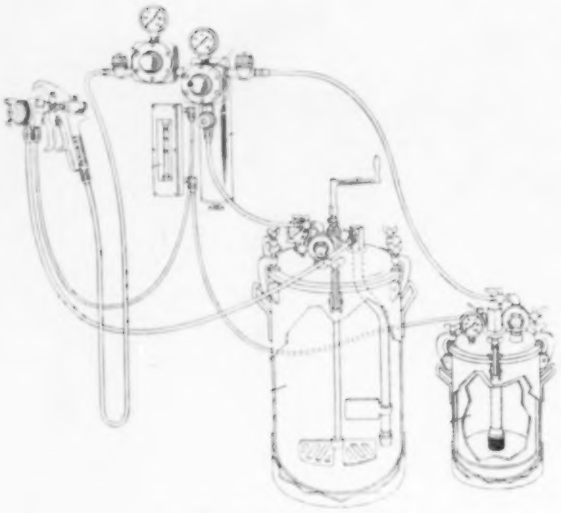


Fig. 10. Catalyst spraying outfit

study was made in the field of controlled temperature. It was soon learned that heated paints were easier to atomize with lower pressures, resulting in the following advantages:

1. Provide a greater film thickness for each pass of the gun,
2. Eliminate much orange peel often caused by poor flow out of material after reaching the surface coated,
3. Reduce overspray, which ultimately means lower maintenance costs.

Different types of heaters have been available for the finishing field for a number of years. These include types where paint is heated directly by:

1. Electricity, employing a hot plate type arrangement
2. Hot air
3. Heated chemical solution where both paint and the chemical solution pass through a conventional type shell and tube heat exchanger.
4. Hot water, with equipment as illustrated in Fig. 12.

This type of a hot water heating system is an adaptation of the familiar hot water system employed for home heating. The water, in this sealed system, is heated by a thermostatically controlled, electrical immersion type heat generator. The generator heating capacity is available in sizes anywhere from 3 to 24 kw. The heated water is delivered, by a unique combination motor pump, into the piping system. The combination of heat generator and water pump can be located away from any hazardous area, therefore general purpose electrical equipment is used.

The heated water passes through exchangers in the vicinity of the spray stations. Here the water heats the paint to the desired operating temperature. To insure that the paint retains its heat up until the moment it is sprayed, a water jacketed paint hose is connected between the exchanger and the gun. Heated water, from the main system, is delivered through the hose jacket to within inches of the gun and then returns to the closed piping system. The return water, which is but a few degrees cooler than the supply water, again passes

Fig. 11. Catalyst Gun

through the generator for reheating and subsequent repumping through the system.

The hot water heating system has the inherent advantage that the paint cannot be overheated once the thermostatic control is set. Temperature control is precise at all times and paint is kept heated up to the gun at all times, whether or not the gun is in use.

For the maintenance field, portable paint heaters, such as illustrated in Fig. 13, are for use in both hazardous and non-hazardous locations. These units, which are available in both 3 and 6 kw sizes, include all the essential components of an industrial type installation. Paint heaters, of the type described, have found wide usage in the industries where electrical applicances, automobiles, furniture, hardware, etc. are manufactured. Users report that the heater equipment reduces waste, produces finer finishes, improves film build and reduces maintenance time.

As a consequence of the ability to maintain uniform viscosities in the range of 140 to 150F, regular finishes, designed for cold spray application, have shown remarkably improved characteristics. This has eliminated the need for formulating special finishes to be used in conjunction with a heating device.

AUTOMATIC SPRAY FINISHING

Mention was made that automatic spray equipment is available for high production as well as quality control finishing.

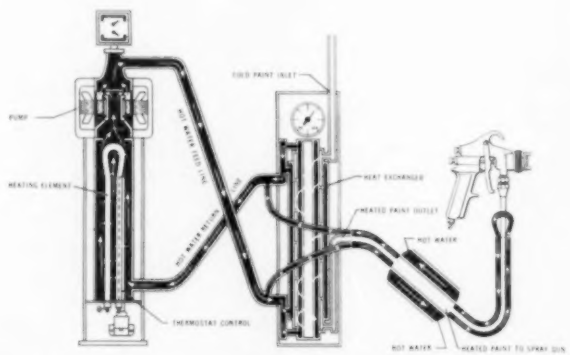


Fig. 12. Hot water paint heater system

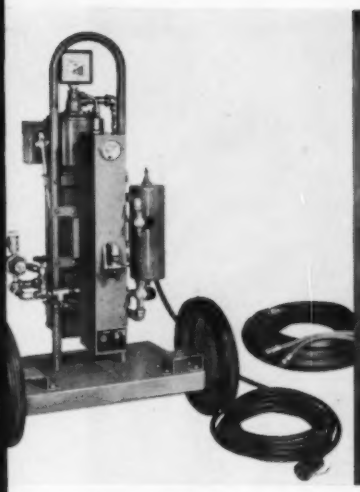


Fig. 13. Portable Paint Heater

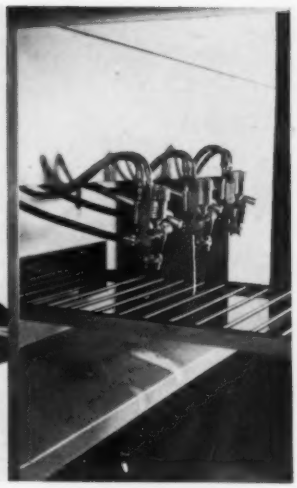


Fig. 14. Automatic Gang Spray

The automatic gun is employed in gang spray operations where one gun or a group of stationary guns spray constantly or intermittently, as required: Objects being coated pass the spray station, on some form of conveyor. These guns can be arranged to spray only when the object to be coated is in the path of the spray pattern.

The first type of automatic operation to be considered is the gang spray arrangement. As the name implies, a group of guns are placed in position, as shown in Fig. 14, so that the guns will spray continuously as the work passes the spray station. The major disadvantages of such a system, are:

1. Since the guns are operating for relatively long periods of time without triggering, they are not purged at regular intervals. This can be the cause for build-up of material on the fluid tip and air cap causing distorted spray patterns.
2. Since each gun consumes a sizable quantity of compressed air for atomization, the total cost of operation can be prohibitive.
3. If one of the guns should fail, it is possible that the missed areas could result in costly production rejects.

To overcome the short-comings of gang spray, there have been made available for industry, the horizontal and vertical transverse machines as illustrated in Figs. 15 and 16. The inherent characteristics of these machines make it possible for one to four guns to do the work of upwards to ten or twelve guns in gang spray arrangement. Triggering the guns at the end of the spray strokes reduces overspray and prevents waste of material. The guns are purged at rapid intervals, which in turn, eliminate the problem of distorted patterns. This means that more uniform coatings may be more consistently applied.

Transverse machines are also available in the contour types where the spray gun is kept at a constant distance from the work, no matter what part is being coated.

These types of machines are widely used in the automative industry for coating body sides, tops and rear decks. For illustration, see Fig. 17.

There is available for industrial use a basic type of rotary machine. This spindle type machine is illustrated in Fig. 18. On this machine, articles to be coated are loaded on workholders, and are carried on a rotating spray table in front of accurately positioned automatic guns. At the precise moment when the work is in the spray area, the guns are actuated. As soon as the work leaves the spray area, the guns cease to operate. The guns may be of the stationary type or, if necessary, they can be arranged to index to follow the work. The rotating table then carries the work to the unloading station. This type of machine is equipped with a skip-spray memory device to insure that only loaded workholders will cause the gun to function when the work is at the spray area.

The chain-on-edge conveyor type machine, figure 19, has found wide use for industrial applications where parts must be coated, baked and cooled at relatively high production rates. Items such as equipment for the military, automotive parts, sporting goods, kitchenware, electronic components, etc. are naturals for this type coating operation. The work is loaded on workholders which in turn are carried on spindles connected to the chain. Just prior to entering the spray station, a memory device provides for a coating if the work is on a workholder. After leaving the spray station, conveyor travel time is allowed for solvent flash off. The work may then be transported through a force dry or bake oven for a predetermined time and temperature. Upon leaving the

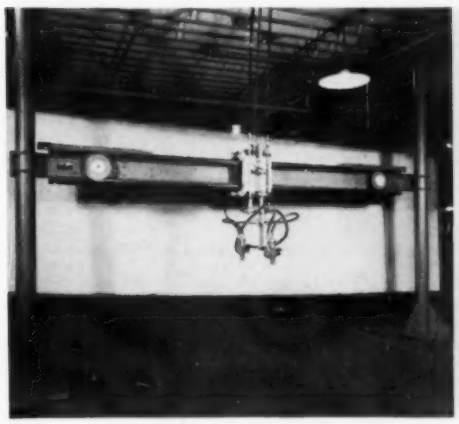


Fig. 15. Automatic Horizontal Transverse Machine

Fig. 16. Automatic Vertical Transverse Machine

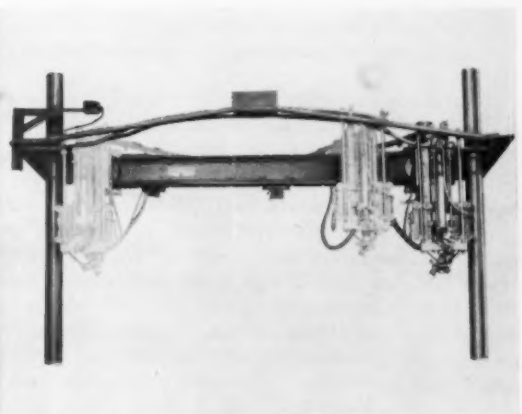


Fig. 17. Automatic Contour Transverse Machine

Fig. 18. Automatic Rotary Machine

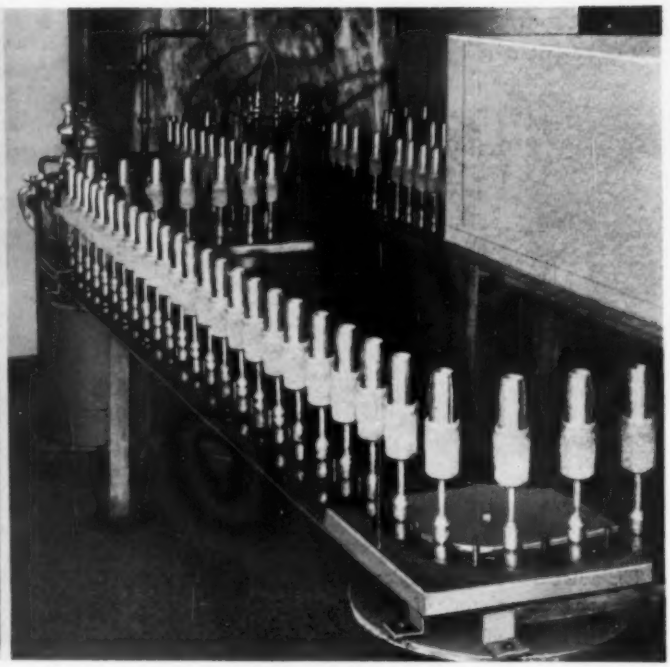


Fig. 19. Automatic Chain-on-Edge Machine

oven, the objects may be force cooled and then removed from the conveyor at an unload station. The overall conveyor length on some of these chain-on-edge machines sometimes exceeds 500 feet.

This type of machine may be equipped so that as many as two or three successive coats of material are applied in one loading and unloading operation. The spray stations may be equipped with either stationary guns or following guns as required for both horizontal and vertical motion.

Additional interesting features of the chain-on-edge machine are:

1. The variable speed drive, which permits changes in production rates as required.
2. Manual and automatic take-ups to insure exact chain tension at all times.
3. Conveyor lengths can be anywhere from 30 to 500 feet or more in length to suit production requirements.
4. Parts to be coated can be as small as lip-stick cases to as large as air conditioning compressor assemblies.

It can be concluded that of all the popular type of automatic machines, the chain-on-edge is the most versatile.

It can now be seen that various components of spray equipment are available for the finishing industry—for the small one gun shop to major industrial finishing plants. Manual guns may be selected for small touch-up operations or for coating comparatively small items. The industrial type manual guns are used for high speed production, such as for conveyerized operations, in appliance manufacturing, furniture finishing and automotive manufacturing plants. They are also used for refinishing large vehicles, such as railroad cars, busses and trucks. Automatic guns are available for high speed production requirements where quality control is improved and maintenance costs are minimized due to the elimination of the human element.

For specialized applications, there are available the catalyst gun, the steam gun and others.

The proper hot water system serves as a major factor in paint viscosity control, insuring unvarying results regardless of ambient temperatures. This essential component of a good finishing system installation can be effective through the use of low atomization air pressures, in reducing operating and maintenance costs in general.

As industrial production in our country increases, there will be an ever continued demand for better, more versatile and faster operating finishing equipment.

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At present, he is Regional Engineer of the DeVilbiss Company, Toledo, Ohio. He has charge of all engineering activities for the company's Eastern Regional Area with headquarters at Springfield, N.J. Accomplishments include the design of all kinds of air input and exhaust systems used by industry.

His designs also include automatic paint finishing systems employed to coat shells for the military, wallboard for building construction, missile components, bowling pins, golf club heads, etc. Central paint circulating systems for the automotive industry have also been designed and installed under his direction. These designs include systems often more than a mile in length to provide paint at various finishing operations throughout the automotive plant.

He received his State of New York professional engineers license in 1946. In 1949, he obtained his New Jersey certificate. Mr. Niedhammer is now president of the Essex County Society of Professional Engineers, affiliated with the New Jersey Society of Professional Engineers and the National Society of Professional Engineers.

MODERN ORGANIC COATINGS

by EUGENE W. KANNING*

INTRODUCTION

In this discussion of modern organic coatings, an attempt is made to describe the modern advances that have been made in the coatings industry during the past ten years and to point out the reasons for the persistent efforts in research to develop new types of protective and decorative coatings and the advantages these new coatings have over the traditional ones.

From an historical standpoint, the paint business is almost as old as civilization itself. Even in the earliest writings concerned with our civilization, reference is made to decorative coatings which can be regarded as paint products. Ancient man was able to use natural products found in his environment either in the ground or in the form of growing matter to produce coating materials which he used primarily for decorative purposes. Evidence of the use of these paint products is still found in ancient excavations. We sometimes wonder how ancient man was able to produce paint products that have such excellent durability.

A typical organic coating may be described or defined as a liquid or semi-liquid material which can be applied to a surface by some mechanical means and, when dried or cured, produces a protective and/or decorative coating furnishing color to the surface. Essentially an organic coating consists of four types of ingredients: a) pigment, b) vehicle, c) solvent and d) additives.

The pigment portion of a paint product imparts to the applied film color and opacity. In addition to these properties, many pigments have the supplementary property of giving a degree of protection to the surface on which the organic coating is applied.

The vehicle portion of an organic coating or paint consists of a variety of materials that will produce a film to protect the surface to which the material is applied and also to serve as a "binder" for the pigment.

The solvent portion of paint products serves the purpose of contributing to the liquidity of the product so that the organic coating is in a liquid condition suitable for application to a surface by some mechanical means. Without the solvent portion in a paint product, the material would be too thick or viscous to apply.

The "additive" portion of paint products consists of a variety of materials added to the formulation in rather small quantities to accelerate the drying properties of the coating, to prevent skinning of the organic coating, to prevent settling of the pigment portion, to promote flow characteristics to the applied film, to prevent "flooding" of certain pigments during the drying of the film, and other types of additive products for certain specialized purposes.

NEW PIGMENTS

New developments in the pigment field for the paint industry have been few in number and perhaps less spectacular than the developments in the vehicle field. The most significant development in pigments for the paint industry during the past thirty years or so, lies in the recognition of the tremendous advantages found in the use of Titanium Dioxide as the pigment for white paint and for most light colors. Before the advent of titanium dioxide, the most widely used pigment was White Lead. Besides the fact that white lead is a semi-poisonous material, where titanium dioxide is not, titanium dioxide as a white pigment in paint products has the advantage of six times the hiding power of white lead, and paint products made from titanium can be much cheaper than products using white lead. Also, the durability characteristics of titanium dioxide are far superior to those of white lead. The pigments that we now use in the paint industry for producing colors have not been improved upon to a great extent in the last 35 to 50 years. The greatest activity in the color pigments research effort has been in the development of organic compounds possessing high color and opacity characteristics that also contain improvements for durability when exposed to ultra-violet light. This has made possible the development of organic coatings for automobile finishes able to withstand the rigors of sunlight without appreciable fading or discoloration.

NEW SOLVENTS

In regard to developments in the solvent field, suffice it to say there have been very few new solvents produced for the paint industry with characteristics hardly any different from the solvents available years ago. One outstanding example of a change in the use of solvents in the paint industry is the almost total disappearance of turpentine in paint products. Within the last few years, turpentine in our industry has almost ceased to exist and has been replaced by products superior to turpentine derived from the petroleum industry and certain by-products from the steel industry.

NEW VEHICLES

The most interesting, most spectacular and most effective developments within the past 30 or 35 years in the paint

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industry lie in the changes that have been brought about by the activities of the chemical industry in the production of synthetic materials to form the basis for the vehicle portion of paint products. Prior to the tremendous activities brought about by the growth of the chemical industry toward the production of materials for our industry, the major portion—if not all—of the vehicles used by the paint industry were derived from natural sources. Linseed and tung oils, for example, previously formed the basis for the majority of paint products. Also many natural gums, either derived from growing matter or from the earth, formed the basis for paint vehicles in conjunction with natural vegetable oils such as linseed and tung. Even today, the paint industry is very dependent upon certain natural products particularly the vegetable oils—linseed oil, tung oil, soybean oil, cottonseed oil, coconut oil and others. However, at the present time, the paint industry is almost entirely free from dependence upon other types of natural products, for instance the natural gums. Derivatives produced by the chemical industry from rosin are exceptions still in wide use by our industry for certain types of products.

A typical oil paint in wide use for centuries and still enjoying wide application, although the oil paints are rapidly being replaced by synthetics, is exemplified by the traditional house paint. House paint, even today, consists of a proper combination of titanium dioxide, white lead, zinc oxide and siliceous matter combined with linseed or modified soybean oil. They form the basis for very satisfactory exterior paints for houses and other types of structures. Prior to the advent of the development of synthetic materials, enamels used for decorative purposes on the inside of houses were produced from the so-called varnishes which were made by cooking certain vegetable oils such as linseed and tung oil with natural gums—rosin, congo gum, etc.

About thirty years ago, it was found that a very interesting resinous material was produced by reacting a polyhydric alcohol like glycerin with a poly-basic acid such as phthalic. When this reaction product was modified with drying oils—linseed, soya and the like—synthetic film-forming materials were found that were very suitable for the production of paint products and had many advantages over the materials previously used based on natural gum products. Today, almost all enamels and other products in our industry with the exception perhaps of house paint are based on these so-called *alkyd resins*. Another example of the conversion from a natural product to a synthetic or semi-synthetic product is found in the modification of certain natural resinous gums such as rosin by synthetic processing. As a matter of fact, rosin by itself is very seldom used in the paint industry, but rosin modified with maleic acid, certain phenol-formaldehyde reaction products, etc. form the basis for vehicles very widely used in the production of certain types of paint products.

Along with the development of the so-called alkyd resins mentioned previously, another development of a synthetic nature was and is still a very important factor in our industry. These are the so-called phenolic resins, synthetic products produced by the chemical reaction between phenol and formaldehyde. This type of resin can best be exemplified by the Bakelite resins which found and still find wide usage in the production of superior clear varnishes and also certain pigmented products of high protective value.

Another very important development during the past 30 years or so in paint vehicles lies in the invention and development of the amine resins. These resins are chemical reaction products of either melamine and formaldehyde or urea and formaldehyde. They are cured by heat and, therefore, are referred to as "thermosetting" resins. These resins form the basis in conjunction with alkyd resins for all of our high grade baking enamels used on refrigerators, washing machines, kitchen cabinets, automobiles and for many other purposes.

In addition to the phenolic resins, alkyd resins and amine resins, many new vehicles for the paint industry have been developed from natural rubber, synthetic rubber and the so-called vinyl resins. These developments have come within the last 30 to 35 years. All of these resins are used in very large quantities for a variety of purposes in our industry.

Although the developments mentioned in the preceding paragraphs are all very important and have had a tremendous impact upon the paint industry and most of them are still used in very large quantities in the production of our products, attention should be given to some of the more recent developments in the paint industry, particularly in regard to vehicles. Some of these recent developments are still in the experimental stage but the results today indicate that they will replace to a large extent the more traditional materials used for many years in the production of paint products.

Before proceeding with the discussion of the more recent advances in our industry, from the standpoint of the development of new vehicles for paint products, it is interesting to speculate on the reasons why these new developments have appeared and the effect which they will have upon the production and use of paint products. In the first place, any development of a new product presupposes the fact that the product it will replace has shortcomings or deficiencies. Practically every new material that is developed is interesting only if it has advantages over the one it replaces. In the paint industry, of course, improvements of every kind have been striven for, including durability, beauty, ease of application, drying speed, lower prices, and constant and dependable supply of raw materials. If the paint industry were still dependent upon natural products such as the vegetable oils and natural gums, the industry would not be stable because many of the natural materials are located on the face of the earth in non-strategic positions from a political standpoint. Many of the natural materials are tied up with the agricultural aspects of our economy and this in itself produces instability insofar as supply and price are concerned. Also, the traditional paint products lack certain very important properties, and the industry is striving at all times to eliminate the deficiencies in the old products by replacing them with new ones which have exceptional, proved properties. Another factor of extreme importance from the standpoint of new developments in the synthetic materials for the paint industry lies in the fact that the chemical industry has had a phenomenal growth. By means of chemical reactions involving synthetic materials, the chemical industry has provided a wide variety of materials of extreme interest to the manufacturer of paint. Without the chemical industry, the paint business would still be producing products that were acceptable a half-century ago.

The more important recent advances in the development of vehicles for paint products, all synthetically derived, the applications these products have and will have, and their advantages over the more traditional paint products are as follows:

Synthetic Rubber Solutions

Prior to World War II there appeared on the market for the manufacture of certain types of paint products a new material derived from natural rubber. This natural rubber product is soluble in certain organic solvents and, when properly pigmented, produces a paint film that is very resistant to acid and alkalies and other chemicals, and is very suitable for the painting of concrete floors and all types of structures exposed to excessive fumes. When the natural rubber supply was cut off because of the war, synthetic rubber based on available materials was substituted for the natural rubber. Therefore, today a synthetic rubber produced by the co-polymerization of styrene and butadiene is used widely for the production of certain types of paint products. The most important use of these paints is for the protection and decoration of masonry surfaces of all types.

Synthetic Rubber Latex

The research on the production of synthetic rubber from styrene and butadiene led to the development of a latex of synthetic rubber suitable for the production of paint products. As a result of this, during the past ten years, flat wall paints based on styrene-butadiene latex have almost completely replaced the traditional flat wall paints based on vegetable oils and varnishes. These products have the tremendous advantages of ease of application, fast dry, washability, stain resistance and, above all, easy clean-up with water rather than foul smelling and expensive solvents.

Polyvinyl Chloride Polymers

Not too many years ago, a tremendous amount of research was directed toward the development of resin materials based upon vinyl chloride when polymerized with other types of materials. A well-known development from this activity is the production and wide usage of the vinyl films used for raincoats, shower curtains, and many other purposes. Further research work on the polyvinyl chloride co-polymers led to the development of soluble resins usable as a basis for the manufacture of paint. Such products are in limited use today and have the very interesting advantages of resistance to chemicals of all sorts and also resistance to some solvents. A most interesting application of polyvinyl butyral is its use for the production of a wash primer pigmented with zinc chromate to give outstanding corrosion resistance properties to both ferrous and non-ferrous metals.

Acrylic Resin Solutions

Following the development of the plexiglass or lucite types of acrylic resin film, the producers of these materials carried out research work leading to the development of acrylic resins that could be dissolved in suitable solvents. They became useful for paint films. Acrylic resin solutions have found wide usage in combination with certain other resins like nitro-cellulose to produce protective films for electroplated surfaces. By virtue of the extreme impermeability of these films to water, the acrylic resin formulations have found usage in perhaps a limited degree in the protection of chrome plate, copper plate, against the corrosive action of the elements found in the atmosphere. The most important use of acrylic resin formulations, at the present time, is for the production of finish coats for automobiles. Coatings of this kind have the advantages of longer-lasting beauty and less maintenance than the enamels and lacquers used previously in the automobile industry. Also, high quality baking enamels based on acrylic resin formulations have found wide application in the kitchen appliance and home laundry appliance industry to give superior characteristics to the finish on such equipment.

Acrylic Emulsions

Following the development of the synthetic rubber latex for decorative and protective coatings mentioned previously, emulsions based on acrylic resins appeared a few years ago. Although acrylic emulsions have not been used as widely as the synthetic rubber emulsions for the production of flat wall paint, the acrylic emulsions do have certain advantages over the synthetic rubber type materials. They have better resistance to staining and also have better washability. The acrylic emulsions for flat wall paint still have one important disadvantage, that is they are slightly more expensive.

Polyvinyl Acetate Emulsions

Coincident with the development of the synthetic rubber latex and acrylic emulsions for flat wall paints, certain manufacturers introduced a polyvinyl acetate emulsion that has practically the same application as the synthetic rubber lattices and the acrylic emulsions, except that the polyvinyl acetate emulsion, when used in flat wall paint, produces products combining greater ease of application and lower cost. Polyvinyl acetate emulsion paints are still in a somewhat experimental stage because sufficient time has not elapsed to determine all of the advantages and disadvantages compared with the acrylic emulsions and the synthetic rubber lattices.

Styrene and Its Derivatives

During the second World War the production of styrene became one of the most important aspects of our war effort, because it was used as the basis for the production of synthetic rubber. At the end of the war, manufacturers of styrene were looking for additional uses for this product and considerable research was initiated and carried out toward the possibility of using styrene in some form to produce resins for the paint industry. One of the successful developments has already been mentioned, namely, styrene-butadiene latex for the production of flat wall paint. Coincident with this research work, styrene was investigated for use as a modifying agent for vegetable oils and also for alkyd resins. Consequently, styrene and certain of its derivatives such as vinyl toluene have found wide usage as modifying agents for drying oils and alkyd resins. The extremely important advantage in the use of styrene and its derivatives to modify a vegetable oil or an alkyd resin is that such modification produces a resin that has an extremely fast drying rate. As a matter of fact, synthetic enamels based on styrene modified alkyd resins will dry with the speed of lacquer and have all of the excellent advantages of a synthetic enamel and none of the disadvantages of nitrocellulose lacquers.

Nylon

Considerable amount of research has been carried out during the past several years toward the development of a soluble nylon which could be used as a paint resin. To date, this development is very much in the experimental stage and to my knowledge very few if any paint products are on the market today based on nylon. However, recognizing the extreme resistance characteristics which nylon has, further work is being carried out toward the development of a paint resin based on a nylon type resin.

Polyethylene:

The importance of polyethylene as a film is well known. During the past few years, polyethylene has been modified into a soluble form that could be made available for the paint industry. Recently, there has been introduced a sulfonated polyethylene with very interesting possibilities for the development of paint products having exceptional resistance characteristics.

Polyesters

A few years ago, many resin manufacturers simultaneously introduced to the market compositions based on catalyzed polyesters that have found wide usage in the coating industry and exceptionally important applications in the production of fiber-glass reinforced structural materials. The plastic boats made of fiber-glass reinforced polyester resins are familiar products. In the paint field, some work has progressed for the use of such resinous materials for protective and decorative coatings. However, at the present time, the most important application of these resins is in the production of structural parts reinforced with fiber-glass and other types of reinforcing materials.

Alkyd Emulsions

A number of companies, both paint companies and resin companies, during the past year or so have been feverishly at work toward the development of emulsion paint vehicles based on alkyd resins. This work is primarily directed toward the development of aqueous paint systems having all of the properties of the present synthetic enamels. The work in this field is still in the experimental stage, but the results today indicate that some day it will be possible perhaps to eliminate the use of inflammable and odoriferous solvents in a wide variety of paint applications both industrial and household. This type of development, of course, is something which the paint industry and the users of paint have been looking for for many, many years. It is too early to predict just how far we will be able to go with the elimination of solvent type paints, but it is hoped that this will be the case in the not too distant future.

Epoxy Resins

By far the most important and interesting development within the last few years in the protective and decorative coating industry is in the introduction to our industry of the Epoxy resins. Epoxy resins are completely synthetic and are based upon the chemical reaction between bis-phenol and epichlorhydrin. These resins, when modified with certain amine resins, form the basis for baking enamels which are almost indestructible. Such enamels either clear or pigmented have chemical and solvent resistance properties far superior to any paint available at the present time. A very important application for such formulations is the use of a clear epoxy type resin for the protection of all types of polished metal surfaces. The epoxy resin film is almost completely impervious to moisture and is resistant to almost every known reagent. Also, the adhesion of epoxy films to polished metal is of a very high order. In addition to the baking type epoxy materials, certain types of Epoxy resins can be cured chemically by the use of polyamine chemicals so that no oxygen or heat is required for the production of a cured paint film. The developments in the field of epoxy resins has been so great that almost all of the major resin manufacturers are in this business. If one were to choose the most outstanding development of recent date in the paint field, certainly the epoxy resins would be at the top of the list along with perhaps the latex or emulsion resins widely used in household paints.

There are several other synthetic materials which have been introduced to our industry during the past year or so but they are still in the preliminary experimental stages of development. For example, the polyurathanes which are widely used today for the manufacture of resilient foams have very interesting possibilities for the production of paint products of unusual characteristics.

Almost each month the chemical industry introduces materials having possibilities in the paint industry. The number of new resins available during the past four or five years make it necessary for us in the paint industry to carry out a considerable amount of formulation research work so that we can keep abreast of the rapid developments brought about by the chemical industry. There is a tremendous future in the paint field but activity in the paint industry is entirely different now than it was even twenty-five years ago. The paint industry is so closely allied to the chemical industry that it is necessary for the paint industry to have available to it only the top research brains in order for it to survive in this highly competitive field.

It is hoped that these remarks concerning the developments in the paint industry during recent years have served to acquaint you with, if nothing more, the complexity of this industry. The paint industry is constantly striving to improve its products to yield materials having properties that were absent in the traditional products manufactured by the paint industry. Time will tell how far we can go, but in this changing world there is no question that the pace will accelerate and some day perhaps we can look forward to the perfect paint product—if there is such a thing.

Eugene W. Kanning was born in Fort Wayne, Indiana. He received his AB, AM and PhD all from Indiana University where he subsequently taught and did research work.

Dr. Kanning entered the industrial world in 1942 when he joined Dow Chemical Company in their research and development division. He later became director of research at The Arco Company.

Eugene Kanning is presently general manager of Kanartex Coatings Division of Kish Industries and vice president of Kish. He served as president of Kanartex from 1948 to 1956.

MODIFIED HULL CELL

Longer Plating Time at Increased Amperage

by JOSEPH P. BRANCIAROLI*

ONE OF THE MOST valuable tools available to the plater for controlling plating solutions is the Hull Cell. With this cell, the plater can see the deposit characteristics of a plating bath at many current densities, on one panel. Tests can be run at various temperatures and currents to determine how these variables will change the deposit characteristics.

The panels can be kept as permanent records to show the effect of the following conditions on the deposit: (1) solution composition variations in primary constituents and addition agents, (2) contamination, and (3) variations in operating conditions such as temperature and current density. Later, if difficulties occur, a study of the record panels tend to aid the plater in solving his difficulty.

Many platers adjust their bath composition and operating conditions by observation of the work coming out of the production tank. This can be a successful method for a plater with a great amount of experience with a particular bath; however, this method at best, does not provide information beyond a limited scope. The range in current density on the work coming out of the tank is not sufficiently large to give a hint of impending trouble before rejects occur. It is much more desirable to be able to predict in advance the lack of necessary constituents or the building up of contaminants.

Hull Cell tests will generally be able to provide this information well in advance of the time when it would seriously affect the work being processed because the test panel shows results at current densities above and below those obtained in production, and it is in these current density ranges that difficulties first show up. If the difficulties are not corrected as soon as indicated, the steady movement of the trouble zone towards the production plating range can be observed on the Hull Cell panel.

The Hull Cell can help the plater decide at which levels to keep his bath constituents. The composition of a bath that has been used for some time might need to be considerably different from the fresh bath formulation to produce good results. It has been said that every plating bath is individual and distinct from every other one of that type. Once impurities have begun to accumulate and establish their own complex combinations, it is difficult to keep such a bath working well without plating tests. Many addition agents can only be controlled by a plating test because analysis is impractical.

The principal components in the bath should be controlled by chemical analysis, although often times a variation in concentration will show up in the Hull Cell test. Even though a complete analysis has been made of a plating solution composition, it is wise to run a plating test in the Hull Cell also.

This test will disclose the effect on the deposit of undetected components. For example, chlorides in a chromium plating bath will cause the covering power to be much less than would be expected from the analysis of chromic acid and sulfate. To compensate for the catalytic effect of the chloride, the sulfate content must be lowered to obtain the desired covering power or the chloride must be removed. After the analytical results have been obtained, the plating test can be used to confirm the need for large corrections to the tank. It is better to check on a small scale rather than to take a chance by adjusting the tank directly.

Besides being a valuable tool to the production plater, the Hull Cell is an essential tool for plating research. It is doubtful if some of the addition agents or new plating baths could have been developed without the Hull Cell. It is more practical to carry on experiments using small solution volumes in the Hull Cell rather than larger volumes in a large cell. The deposit characteristics, which can be observed on a Hull Cell panel, may pass unnoticed with a test method using a different type cathode, which has a limited current density range.

The Hull Cell has been used extensively for tests employing currents up to five amperes. There has been much work done using tests where the temperature is high—135F; and the current is low—three amperes. Under such conditions, the plating test can be conducted with little difficulty in holding the temperature constant.

However, when it is necessary to use a temperature of 105F and a current of five amperes, it is rather difficult to hold the temperature constant. Often times the plating conditions cannot be made severe enough because of such fluctuations. The commonly used plating tests for chromium baths have proven inadequate because of these temperature fluctuations.

The testing of chromium baths in the Hull Cell at a current of five amperes can produce very misleading results. The current density at the left end of the panel will not be as

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TABLE I

Current Distribution on Hull Cell Panels Plated in the 267 ml. Hull Cell

Current Used Amperes	Current Density, Amp/Sq Ft						
1	42	27.5	19	13	8.4	4.5	1.2
2	84	55	38	26	16.8	9	2.4
3	126	83	57	39	25	13.5	3.6
5	210	138	95	65	42	22.5	6
8	336	220	152	104	67.2	36	9.6
10	420	276	190	130	84	45	12
15	630	414	285	195	126	67.5	18
20	840	552	380	260	168	90	24
	0.5	1	1.5	2	2.5	3	3.5

Distance from High Current Density End, Inches.

high as can be encountered in decorative chromium plating of irregularly shaped objects. Current densities employed in hard chromium plating will normally always exceed that attainable on a five-ampere Hull Cell panel. Plating at this low current may not show burning, haze, or other difficulties which may be encountered in production at current densities above 250 amp/sq ft. These conditions can be reproduced on a Hull Cell panel when the test current is raised.

The information presented in Table I was obtained in part from literature supplied by R. O. Hull & Company, Inc. The table was calculated from the equation:

$$A = C(27.7 - 48.7 \log L)$$

where A is the current density at the selected point, C is the total current applied to the cell, and L is the distance in inches of the selected point from the high current density end of the plate.[1]

The equation applies for L between ¼ and 3-¼ inches only. Since the part of the equation inside the brackets is the same for any point selected, it is a simple matter to determine the current density at that point for a variety of cell currents by multiplication with the appropriate factor.

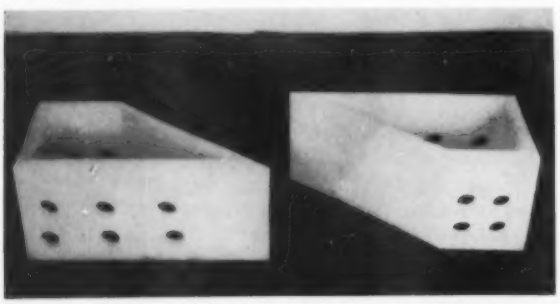

Fig. 1. Two views of the Modified Hull Cell showing the location of the holes.

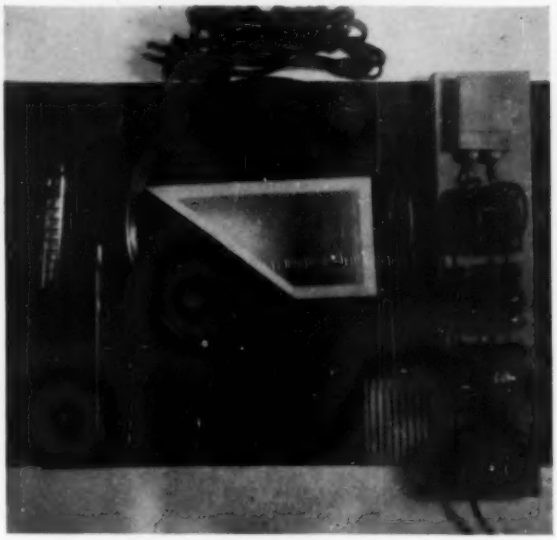

Fig. 2. An overhead view of the equipment used with the modified cell.

When the testing conditions require a high current, such as 10 amperes, it becomes quite difficult to hold the temperature of the small volume constant in the standard Hull Cell. Any testing at the higher currents will necessarily require a very short plating time so that there will not be a large fluctuation of temperature from the start to the finish of the test.

Experience with the use of 10 amperes for testing chromium plating baths at 115F indicates that a two-minute period is about as long as the test could be run if some temperature fluctuation could be tolerated. The 115F would be the average temperature since the test would usually be started at 112 and ended at 118F.

The immersion of the Hull Cell in a cooling bath was not very effective for holding the temperature constant due to inadequate heat transfer properties of the unit during operation. Pumping the solution out of the Hull Cell and replacing it with cool solution was quite involved, but partially successful; however, this latter system would introduce undesired variables.

A method was finally devised which would permit long-time plating tests with small volumes of solution. This method was centered on a modification of the standard Hull Cell. The introduction of some holes in the two parallel sides of the Hull Cell would permit solution circulation. Fig. 1 shows each parallel side of the Modified Hull Cell.

The half-inch holes were kept towards the anode end of the long side of the cell, thereby retaining the restriction effect at the very low current density. The exact size and spacing of the holes are not critical.

The Modified Hull Cell is used inside another vessel, which is then filled with solution to the mark on the Hull Cell. It is desirable to use the same mark to control the plating area on the panel so that established current density relationships are still applicable.

Operation of this Modified Hull Cell at 10 amperes and 115F is possible for very long periods of time without temperature fluctuation. There is a natural movement of the solution by convection, which slowly replaces the solution in the Modified Hull Cell. This continuous solution replacement keeps the temperature constant under most of the operating

conditions normally used. Table II shows a comparison of the temperatures in the two cells during testing.

The data presented in Table II shows that even though at 15 amperes the temperature fluctuation in the Modified Hull Cell was six degrees, it was considerably less than that which occurred in the standard Hull Cell. Stirring during the 15 amperes test made the temperature remain quite constant.

If the temperature rises due to the low initial temperature or the high currents being used in the testing procedure, stirring outside the modified cell will rapidly lower the temperature. Stirring will not cause any effect on the deposit unless very violent stirring is used. Violent stirring may cause the deposit to be rounded off at the low current density area.

The rate of temperature change during operation of the Modified Hull Cell depends upon the initial temperature, the size of the test solution, the rate of air velocity past the testing location, the amount of stirring (if any) outside the cell, and the type container used to hold the test solution.

If the temperature is quite low, such as 105F, it would be expected that a temperature rise would occur more readily than if the initial temperature were 130F. In the latter case, the radiation and convection effects might cause a cooling of the solution. The container could be insulated to prevent some of the heat loss, or additional heat can be supplied with an immersion heater or hot plate. Test conditions which are so extreme that stirring will not hold the temperature down require the use of a small cooling coil outside the Modified Hull Cell. If the testing is done inside a hood with high air velocity, there will be a decided cooling effect on the solution, especially if a glass container is used.

The Modified Hull Cell can be used in a 6.5-inch crystallizing dish in which the Hull Cell will fit very closely. In this container, a small volume, such as one liter, may be used for tests. A very flexible setup using the modified cell could contain an immersion heater and a thermo-regulator to permit the use of high temperatures and long plating periods. This can be accomplished very simply by using a 7.5-inch crystallizing dish or similar container.

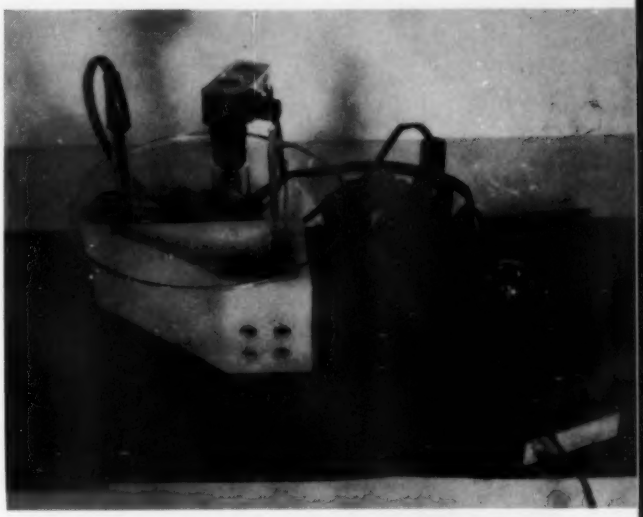

Fig. 3. The Modified Hull Cell and accessories assembled for use.

Fig. 2 shows a layout of the apparatus which can be used in the operation of the Modified Hull Cell. A short immersion heater with a 100- to 250-watt capacity and a thermo-regulator may be plugged into a control board containing a signal light and a condenser to prevent damage to the regulator contacts.

The immersion heater and thermo-regulator are very useful if a series of tests are to be run or if high temperatures are to be employed. Fig. 3 shows the apparatus assembled for use. The immersion heater and thermo-regulator may be held by using a support stand with clamps or by other suitable means. The Modified Hull Cell can be held in a fixed position inside a production tank if desired so that even less has to be done to test a solution than when it is done in a small container.

TABLE II

Comparison of Operating Temperature in the Modified Hull Cell and Standard Hull Cell

Type of Hull Cell	Current Used	Temperature* F					
		Start	One Minutes	Two Minutes	Three Minutes	Four Minutes	Five Minutes
Modified	10	110	110	110	111	111	111
Standard	10	110	112	116	119	121	124
Modified	10	120	120	120	120	120	120
Standard	10	120	122	124	127	130	132
Modified	15	120	122	123	124	125	126
Modified**	15	120	121	122	122	122	122
Standard	15	120	128	132	137	140	140

*Readings were to nearest degree. Solution volume in 6.5 inch crystallizing dish was one liter.
**Frequent stirring was used outside of Modified Hull Cell.

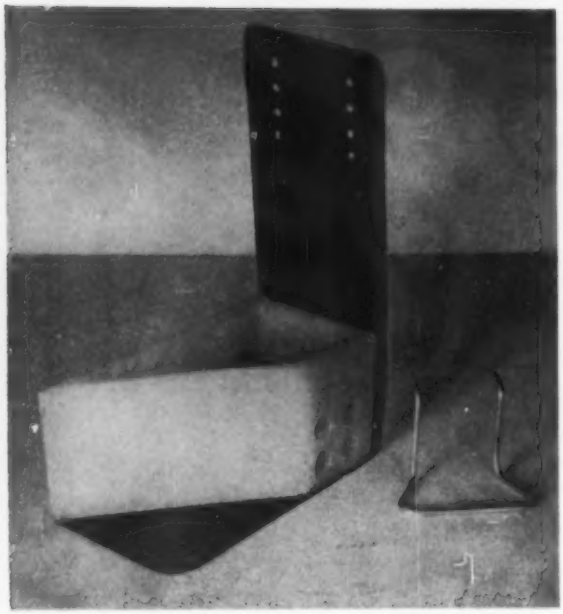

Fig. 4. An example of a platform to hold the modified cell in a production plating tank.

The ingenious plater undoubtedly will find many suitable ways to hold the modified cell in the tank. One method, shown in Fig. 4 consists of making an "L" shaped, coated, metal platform to support the cell. A series of holes at the top of the platform can be used as stops to make the mark on the Hull Cell, rest at solution level. A "C" clamp may also be used to support the platform against the side of the tank.

While primarily intended for use in testing chromium plating baths, the Modified Hull Cell can be used for any bath where high current density tests are desired. With chromium baths, it has been found that the modified cell will provide a very severe plating test that produces entirely different results than was possible with the standard Hull Cell. The tests are more realistic and can duplicate more closely the exact conditions present in the production plating tank.

The results obtained from the standard Hull Cell were not very meaningful because during the testing when high currents or long test periods were used, the tank conditions could not be maintained. Testing under these conditions in the standard Hull Cell required certain compromises.

The initial starting temperature had to be much lower than the actual tank temperature. As the test progressed, the temperature would rise above the tank temperature. A burn might be introduced by the lower temperature that was not being obtained in production. The higher temperature might introduce a haze, which was not present on the production parts at the operating temperature. Needless to say, it is desirable to plate for the full test period at the exact temperature used in the tank.

If thickness measurements are to be made on the test panel, a constant temperature is desirable to obtain results of value inasmuch as the cathode current efficiency changes with temperature changes. Since the covering power of a chromium bath increases as the temperature is lowered, a lower test temperature than is being used in the tank will produce misleading results by showing better covering power than the plater can obtain.

Another factor which might be improperly indicated is the stress cracking of chromium deposits, a condition which becomes worse as the temperature is lowered. The standard Hull Cell will create an excessive ratio of amperes per gallon.

Although the principal reason for the change in design of the Hull Cell was to control temperature fluctuation due to high currents desired in chromium plating tests, it can be used to good advantage for all normal Hull Cell testing at the low currents as well. With the Modified Hull Cell, additions can be made on the basis of the commonly used dry material relationships, such as grams per liter or ounces per gallon, as well as with the equally practical liquid relationships. The larger additions thus made will generally assure greater accuracy in measuring.

Since there normally will be four or more times the volume of the standard Hull Cell, many more tests can be made on a solution without depleting the bath of important components, especially when the bath being tested requires an insoluble anode. This increased volume minimizes the need to empty and refill the standard Hull Cell which must be done often when a bath employs critical addition agents or brighteners.

The Modified Hull Cell has been used for almost all solution testing work and research investigations for approximately six months. The four investigators who have used the unit are well pleased with the versatility of this new tool for the plater. Because the Modified Hull Cell has been so well accepted by experienced personnel, the information is being supplied to the metal finishing industry to help promote better solution control and make it easier for research investigators to improve metal finishing solutions.

REFERENCE

[1]Hull, R. O., "Plating Test Control of Plating Baths", Proceedings, American Electroplaters' Society, 31st Convention, pp. 95–104, (1944).

Joseph P. Branciaroli is a technical sales representative for the Chromium Chemicals Division of Diamond Alkali Company. Since joining Diamond Alkali in 1952, he has been closely associated with various new developments in the field of chromium plating. Some developments have been the subject of papers.

Mr. Branciaroli previously was employed at Wright Air Development Center, Dayton, Ohio where he worked in the field of research and development on metal finishing projects. A broad background was obtained there in plating, metal treatments and corrosion.

His education was obtained at West Virginia University where he obtained a BS degree in chemical engineering in 1950. Mr. Branciaroli served in the Infantry for three years during World War II and for one and a half years in the Air Force during the Korean crisis, emerging as a first lieutenant. He is presently a member of the American Electroplaters' Society, National Association of Corrosion Engineers, American Society for Metals and American Ordnance Association.

SUMMARY OF OBSERVATIONS OF FACTORS INFLUENCING ADHESION OF ORGANIC COATINGS TO CHROMIUM PLATED SURFACES

First Progress Report of Section F on Oganic Finishes on Plated Metal Coatings, of Subcommittee V on Supplementary Treatments for Metallic Coatings, ASTM Committee B-8 on Electrodeposited Metallic Coatings

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This report summarizes the observations that have been made regarding factors which influence the adhesion and retention of (clear) organic coatings to chromium plate. The purpose of this report is to serve as a guide for those interested in the use of supplementary organic coatings on chromium-plated surfaces.

In the observations reported below, several methods of determining adhesion were used. In general, initial adhesion was determined by scribing through the organic coating to the plated surface and measuring adhesion by either the knife test or the tape test. Retention of adhesion was determined after exposing the coated chromium-plated articles to outdoor weathering, to humidity, to water immersion, or to salt spray, after which the coating was scribed to the plated surface and the adhesion determined by the knife test or the tape test.

Summary of Observations

As on any metal surface, the specific formulation of the organic coating and its application to the plated surface are important factors influencing adhesion to the chromium plate. However, these factors are not within the scope of this study. Furthermore, this study is not concerned with such properties of the organic coating as exterior durability, resistance to discoloration, resistance to humidity, hardness, and marring, although these properties are important depending upon the specific service requirements of the finished article.

In the following comments, it is assumed that the organic coating under consideration does have good adhesion to chromium plate that has been plated under ideal conditions and that the application of the coating is accomplished in such a manner as to develop maximum properties for the service intended, that is, applied at the proper thickness to form a continuous film, properly dried and so on.

Ideal Conditions:

The organic coating is applied to a plated surface deposited from a homogeneous chromium plating solution in which the final rinses are distilled or demineralized water and the organic coating is applied immediately after the plated surface is dried. Under these conditions, optimum adhesion and retention of adhesion under exposure conditions is obtained.

Variations from the Ideal Which Affect Adhesion:

1. The time interval between plating and coating is important. If the plated parts are exposed to plating room atmosphere, that is, humid, acidic, or alkaline atmosphere, this time interval must be short. General observations indicate that longer than 2 to 4 hr exposure to plating room atmosphere is detrimental to adhesion. If the plated parts are exposed to clean and dry atmosphere such as may exist in a coating department area, the time factor is not critical. Two days may elapse under such conditions without affecting adhesion.

2. Hardness of the Final Rinse Waters.—Poor adhesion has been reported with as little as 2 ppm in the final rinses. With chromic acid treatment of the chromium plate (described below), good adhesion has been reported with as high as 170 ppm.

3. Irregular Additions of Chemicals for Chromium Plating Bath Maintenance.—Poor adhesion has been reported immediately following large additions of chromic or sulfuric acid or water for makeup purposes. However, this has not been completely confirmed, especially when the plating solution is mixed until homogeneous after such additions. It is suggested that irregular additions may be a cause of poor adhesion if no other factors for the poor adhesion are apparent.

4. No effect on adhesion has been observed with variation in the chromic acid to sulfate ratio or in current densities in the range normally employed.

5. Differences in the base metal (steel, zinc, or brass) do not affect adhesion on copper-nickel-chromium plate.

6. Variations in nickel plate thickness do not appear to affect adhesion. A flash of nickel is equal to 0.0005 in. of nickel.

7. Adhesion is poorer on chromium plated directly on copper without nickel than on chromium plated over nickel.

Effects of Various Treatments of the Chromium Plated Surface to Overcome Variations from the Ideal:

1. Sulfuric acid treatment causes poor adhesion. A quick dip in hydrochloric acid results in poor adhesion. Contradictory results have been reported with phosphoric acid treatment.

2. Vapor degreasing does not improve adhesion.

3. Dilute chromic acid treatment is the most effective. This consists of immersing or spraying with a mixture consisting of 2 to 4 oz of chromium oxide per 100 gal of demineralized or distilled water. Variables in the treatment affect adhesion as follows:

(*a*) Temperature variations between 140 and 180 F do not influence results.

(b) Variations in treating time between 10 sec and 2 min have no effect. Both treating times are satisfactory.

(*c*) Low solution temperatures such as 110 F are reported to be less effective than 140F.

(*d*) Sulfate contamination of the solution, which may occur if plating solution is used to prepare the dilute chromic acid solution or if dragout occurs, requires longer treating time; 2 min is more effective than 10 sec.

(*e*) The final rinse after treatment with dilute chromic acid is important. Demineralized water should be employed. If the final water rinse has a *p*H above 7, poor adhesion will result. Without a rinse, visible chromic acid stains occasionally occur; such stains result in poor adhesion.

(*f*) The time interval between treatment and coating is important. Shorter times produce the best results, as noted above.

On Buffed Chromium Plate:

1. Vapor degreasing, washing with hydrocarbon solvent or alcohol, or alcohol containing traces (100 ppm) of chromium oxide are not effective in obtaining adhesion.

2. Electrocleaner followed by dilute chromic acid treatment as described above is necessary to obtain adhesion.

F. L. Scott
Chairman

Abstracts of Papers Presented at the

ALL UNION SCIENTIFIC/TECHNICAL CONFERENCE ON CORROSION AND PROTECTION OF METALS

Metal Coatings and Chemical Treatment Sections, and Lacquer Coatings Section

MOSCOW, USSR, MAY 19-24, 1958

Part 2

ELECTRODEPOSITION OF A DURABLE ALLOY OF NICKEL-PHOSPHORUS

by M. E. Goldstein

1. The process of chrome plating used on surfaces of hardened parts of machines, has unsatisfactory performance as to low output per current, bad dispersal capacity of the electrolyte, which necessitates the use of high current density.

There is a great interest both in the USSR and abroad to develop a process of depositing nickel-phosphorus coatings having high durability and great hardness (67 R_c).

2. The electrolyte is composed of nickel sulfate, nickel chloride, phosphoric acid and sodium hypophosphite.

Those electrolytes which do not contain sodium hypophosphite deposit common nickel coatings that do not contain phosphorus. The presence of hypophosphite in the electrolyte protects the deposit on the cathode of nickel-phosphorus alloy. With increased concentration of hypophosphite in the electrolyte from 0.05 to 10 g/l, there is an increase in the coatings from 0.12 to 10–13 per cent.

3. With increased content of phosphorus the coating increased in hardness for 52 R_c (in the absence of phosphorus) to 57 R_c (with 1.3–1.5 per cent phosphorus). Further increase in content of phosphorus does not increase the hardness.

4. Phosphoric acid shows a stabilizing influence on the contained hypophosphite in the electrolyte and the contained phosphorus in the coating in the process of electrolysis.

5. From the work is constructed a curve of dependency of output per current on temperature, *p*H of the electrolyte, content of hypophosphite, current density, and also the content of phosphorus in the coating and the temperature of the electrolyte on the current density. We set up the optimal technological parameters for depositing bright hard nickel-phosphorus alloy. The rate of deposition of the coating is 0.07–0.1 mm/hr.

6. The dispersal capacity of the electrolyte of the solid nickel plating is significantly higher than standard electrolyte of chrome plating and almost has no difference in dispersive capacity from that for the common electrolyte for nickel plating.

7. Heating coatings at temperatures of 400–900C for the course of an hour increased its hardness from 57 to 67 R_c. Further increase in temperature of thermal treatment at 800C does not change the hardness of the coating.

8. The content of phosphorus in the coating is determined by its structure which may be columnar, columnar-plated or plated.

9. The ductility hardness of nickel coatings with content of phosphorus of 9–13 per cent is like that of the ductility of a chrome coating. Thermal treatment of nickel-phosphorus coatings are somewhat lower in their ductility.

10. Phosphorus-nickel coatings of thickness 25–30μ if they are not submitted to thermal treatment have no pores. The porosity of thermally-treated solid nickel coatings and general coatings are similar.

11. The corrosion resistance of nickel-phosphorus coatings under atmospheric conditions and in tap water is higher than chromium and common nickel coatings.

12. The coefficient of friction of nickel-phosphorus coatings on castiron and steel is 30 per cent lower than for chrome coatings. On friction with bronze, the chrome has a somewhat lower coefficient of friction.

13. The general scheme of technology of the process of hard nickel plating is not different from the standard process of applying galvanic coatings.

For the process of solid nickel plating 3–4 times less dc power supply is required than for chrome plating. The rate of the process of hard nickel plating is 3–4 times greater than the rate of the process of chrome plating.

The outlay of electrical energy is less than for chrome plating, by approximately 20 times. Hard nickel-phosphorus coatings may be recommended as a durable and a protective-decorative coating.

THE CATHODIC PROCESSES ON ELECTRODEPOSITION OF THE ALLOY IRON-NICKEL

by Prof. P. S. Titov and N. V. Korovim

We investigated the process of electrodeposition of alloys of iron-nickel from chloride and sulfate solutions. We studied the influence of different factors: concentration of iron ions, nickel, citric acid, aluminum-sulfate, current density, temperature, *p*H and agitation on the composition of the alloy and yield per current. The following was found:

1. Alloys of any composition may be obtained similarly from sulfate and chloride solutions. Relatively, the content of iron in the deposited alloy at temperatures below 50C is always higher than the relative concentration of it in solution, though the potential of discharge of iron in electrolytes containing only ions of iron is more negative than the potential of discharge of nickel irons.

On joint deposition there occurs depolarization discharge of ions of iron and polarization discharge of nickel, the discharge of ions of iron retards the discharge of ions of nickel.

2. In the cathodic process on deposition of alloys of iron-nickel there is a significant influence of the concentration change at the layer next to the cathode especially at increased current density.

3. An analysis of the work conducted by other investigators in electrodeposited alloys Ni-Co, Fe-Co, Ni-Zn, Fe-Zn, Co-Zn, Ni-Mn, Co-Mn, Fe-Mn, Cu-Al, Cu-Zn, Pb-Sn, showed that in all of these cases, as we also found, the discharge of ions of metals evolved on the cathode with lower polarization, slowed up the rate of evolution of metals discharging with higher polarization.

IV. ELECTROLYTIC COATINGS

(Coating Objects of Light Alloys, Depositing Silver and Cadmium from Noncyanide Electrolytes, Change of Mechanical Properties of Steel in the Process of Depositing Galvanic Coatings)

GALVANIC COATING OF OBJECTS OF LIGHT ALLOYS

by Prof. V. I. Lainer

1. The tempo of growth of the production of light alloys has significantly outstripped the production of alloys of the heavy metals—ferrous or non-ferrous.

At the present time the volume of production of aluminum and its alloys is second to the production of alloys with those on an iron base. There is also a further tendency to force the expansion of the light alloys.

2. Although at the present time light alloys, as a rule, are submitted to electrochemical oxidation for imparting a series of physico-chemical properties to the surface, often there develops the necessity to apply a galvanic coating to it.

3. The specific hardness, developed on applying a galvanic coating on objects of light alloys comes from the presence of an oxide film on the surface and the strongly electronegative potential of these alloys.

Among the different methods of preparing the surface of the aluminum or magnesium objects, the most widely adopted is the method of applying a thin zinc film by immersing the aluminum objects in solutions of sodium zincate, and magnesium objects in solutions of zinc pyrophosphate.

4. It was established that the tighter and thinner the zinc films on aluminum the more stable the bond to the galvanic coatings, and the better is the protective coating of the object to corrosion. The structure of the zinc film depends on the composition of the zincate solution, temperature and length of time of immersion, the composition of the treated alloy, the method of previous preparation of the surface, and other factors.

5. We established that fully reliable and reproducible result was obtained after zincate treatment of aluminum alloys, nickel plating them for 30 min, and heating at temperature of 220–230C. Treatment in this manner will then allow objects to be submitted to a copper plate, chrome plate or other galvanic process.

6. Different forms of galvanic coatings of aluminum objects mainly for protection/decoration and durability are obtained by chrome plating, tinning or silvering. Magnesium alloys submitted to copper plating, nickel plating and chrome plating are protective/decorative, and durable. Chrome plating does not affect fatigue durability of aluminum alloys.

7. With sufficiently thick protective/decorative coatings: for aluminum objects by nickel—chrome, copper-nickel-chrome, or nickel-copper (acid)-nickel-chrome, for magnesium objects by copper (cyanide)-nickel-chrome are as corrosion resistant to an outdoor atmosphere as objects of zinc alloys and also of objects coated with them.

THE DEPOSITION OF SILVER AND CADMIUM FROM NONCYANIDE ELECTROLYTES

by P. S. Chechel

Electrolytic silvering is generally conducted in cyanide electrolytes, sometimes one uses ferrocyanide or iodide electrolytes. The poisonous nature of cyanide electrolytes and also the shortcomings inherent in ferrocyanide and iodide electrolytes make it necessary to investigate other electrolytes for silver plating.

1. Silver Plating from Ammonium Thiocyanate Electrolytes

On solution of oxides of silver or from thiocyanate salt in solution of ammonium thiocyanate there forms complex thiocyanate compounds of silver, soluble in excess ammonium thiocyanate. The solubility of thiocyanate complexes of silver increases with increased concentration of free ammonium thiocyanate.

In thiocyanate electrolytes containing the thiocyanate complexes of silver, the equilibrium potential of silver is in the region of negative magnitudes; therefore, contact evolution of silver on copper and brass electrodes is a slow process.

On deposition of silver from neutral, acid and alkaline thiocyanate electrolyte, there is a large cathodic polarization, which contributes to the formation of finely crystalline structure of deposit.

The structure of the cathodic deposits of silver shows the positive influence of added gelatin. Added potassium chromate retards contact exchange of silver on iron and copper.

Under given conditions, it is possible to deposit silver from ammonium thiocyanate electrolytes on copper and brass objects.

2. Silvering from Ammonium Sulfate Electrolytes.

On dissolving silver oxide or its nitrate salt in a concentrated solution of ammonium sulfate, there forms a complex compound of silver. In ammonium sulfate electrolyte there occurs a strong contact evolution of silver on copper and iron. After preliminary treatment of the cathode in a solution of potassium chromate in ammonium sulfate electrolyte at *p*H of 7.0, in the presence of added potassium chromate, the rate of contact exchange on iron is somewhat retarded, which makes it possible to silver steel objects spontaneously.

We investigated the influence of the composition of the ammonium sulfate electrolyte and additions to it of colloidal and surface active substances on the structure of the cathode deposit of silver.

We chose a composition of electrolyte and process of electrolysis for depositing silver from ammonium sulfate electrolyte on iron and steel objects.

3. Cadmium Plating from Ammonium Electrolyte

On dissolving cadmium oxide in a solution of ammonium sulfate or ammonium chloride, a stable aquo ammonium complex cadmium compound is formed. In these compounds of cadmium it enters the composition as a complex cation.

In the process of electrolytic deposition of cadmium from ammonium sulfate and ammonium chloride electrolytes, there is a high cathodic polarization, the character of which changes with increased current density. From analysis of the polarization curves it follows that at small magnitudes of current density, polarization—obviously—is determined by the slow course of the cathodic reactions, and the higher the current density close to its limiting value, the conditions are set up to slow down the addition of ions of cadmium to the surface of the cathode.

We examined the electrolytically obtained finely crystalline deposit of cadmium. The uniformity of distribution of the deposit on the surface of the cathode is somewhat less than in complex cyanide electrolytes, but significantly greater than that used in practical acid sulfate electrolytes.

The allowable cathodic current density in ammonium chloride electrolytes does not exceed 0.7 a/dm² as a consequence of the poor solubility of the complex ammonium chloride salt of cadmium. On introduction into the electrolyte of cadmium chloride the permissible cathodic current density may be significantly increased, but it damages the dispersion capacity.

The solubility of the cadmium ammonium sulfate complex in a concentrated solution of ammonium sulfate is significantly greater than the solubility of the ammonium chloride complex, thereby permitting a current density in ammonium sulfate electrolytes at 25C, to attain 2a/dm² and an increase with increased temperature and mixing of the electrolyte.

The structure of the cathodic deposit of cadmium is shown to be influenced by the *p*H of the solution; better quality deposits are obtained in the range of *p*H from 6.5 to 8. We investigated the influence of some added colloids, surface active and other substances. The most effective influence on the structure of the cathode deposited cadmium evolved from a sulfate electrolyte was the addition of gelatin and $Sn(OH)_2$.

We investigated the dependence of the porosity of the cadmium deposit on its thickness, determined

its corrosion resistance to sea water, and presented the visual character of its structure with micrographs.

Ammonium sulfate electrolyte containing aquo ammonium complex compounds of cadmium may be used instead of the poisonous cyanide electrolyte.

THE INFLUENCE OF THE STRUCTURE OF STEEL ON THE INCLUSION OF HYDROGEN DURING ELECTROLYTIC TREATMENT

by G. D. Volpert

1. In practice it is often noted that with the same form of object, using the same type of steel and utilized under similar conditions, there is a significant difference in the length of time it can be used and its physical-mechanical properties.

2. The change of properties of the object with electrolytic coatings depends (along with a number of other reasons) on the change in the magnitude of included hydrogen.

3. Our study of the reasons for the change in the properties of the same type object by coating leads to data on the significance of the influence on structure of thermally treated objects, of the quantity of included hydrogen. So, for example, analysis of the properties of objects with coatings are described as having different effects due to thermal treatment, obtained by different establishments. From one of these establishments, objects of carbon steel were reported as having a martensite structure. Other enterprises used hardening with insufficiently active cooling, with the result that the structure of the hardened objects, along with martensite were noted to have sorbite in a stage of breakdown, troostosorbite and troostomartensite.

4. The relative quantities of hydrogen, diffused into a steel object, under comparable conditions of electrolytic treatment is found to have the following correspondence of the quantity of hydrogen, diffused into steel, isothermal heating hardening to a martensite structure:

a) normalized steel 2
b) steel with a sorbite structure 8.8
c) steel with a troosite structure 3.8
d) structure—a granular cementite 2

5. For the electrolytic coating described, hardened steel is used. Processing was done under the most favorable conditions to make martensite structures. High annealing of carbon steel is no guarantee of producing a fully useful electrolytic coating. So, annealing at a temperature of 400C conducted to obtain the troosite structure also increases the quantity of diffused hydrogen on cathodic treatment by 3.8 times (compared to a martensite structure). Annealing at 600C conducted to obtain the sorbite structure also increases the diffusion of hydrogen by 8.8 times (compared to a martensite structure).

6. With steel samples submitted to cathodic treatment, hydrogen occurs in a state of solution in the crystals of ions (in the form of atoms or ions) and in the form of an accumulation of gaseous hydrogen at the borders of grains and in spaces. The quantity of absorbed hydrogen is determined by the density of the structure. The tension of the lattice of martensite has very small porosity for the diffusion of gaseous hydrogen.

7. The rate of diffusion of hydrogen on chemical or electrochemical treatment depends (apart from the structure of the steel) on the current density and on the state of the surface of the object, the composition of the steel, the temperature and concentration of the solution, the time of saturating it, and the presence of different additives to the electrolyte.

8. The inclusion of hydrogen in the steel lowers its lengthening and contracting resiliency, lowers the ductility and increases the hardness of steel. So, for example, it reduced the magnitude relative to lengthening after cathodic treatment of spring steel by 17 times.

9. Lowered mechanical properties, caused by chemical and electrochemical treatment, in the course of time is partly reduced. However, this reduction (relative to a lengthening and a narrowing resiliency) at the expense of setting free hydrogen at normal temperatures without subsequent thermal treatment may attain, even at favorable conditions, only 20–60 per cent of the initial magnitude. The easiest of all to be self-evolved at room temperature is atomic hydrogen, soluble in the lattice of iron. Full removal of molecular hydrogen occurs with much difficulty—it requires a heating of not lower than 400C.

10. The possibility of significantly lowering the quantity of included hydrogen at the expense of selecting a corresponding composition of steel and a rational thermal treatment may in full measure be used for objects submitted to electrolytic coatings.

ZINC PLATING STEEL SPRINGS AND RETENTION OF THEIR MECHANICAL PROPERTIES

by A. M. Ginberg and A. P. Gorina

The most widespread form of coating for steel springs is zinc and cadmium plating. Zinc and cadmium plating make it possible to ensure satisfactory corrosion resistance of springs, but it develops so-called hydrogen embrittlement, causing a significant lowering of the springy properties of the steel. We investigated the possibility of retaining the springy properties by tempering (R_c = 47–55) steel springs after zinc plating.

We studied further the common factors (composition of the electrolyte, temperature, current density and the length of time of treatment), influencing the mechanical properties of these springs. We investigated the influence of applying an ultrasonic field on etching and zinc plating steel springs and also the influence of reversing current on electrodeposition of zinc.

For investigating the change in the mechanical properties of springs on applying coatings and in conducting preparative operations, we used samples of steel of thermally treated strips marked U8A-2PK of dimensions 150 by 100.3 mm. After preparing all of the samples of springs, we submitted them to tempering at temperatures of 270–280C for two hours, followed by cooling in air. Samples, after degreasing, etching and zinc plating in different electrolytes were submitted to mechanical experiments by bending, using a special apparatus. The results experimentally took into account the magnitude of the angle of bending on which there occurs the breaking of the sample. For finding comparative results, we obtained data on the angle of bending at which breaking occurs for the untreated samples also.

Degreasing of the sample was done by chemical as well as by electrochemical means. It was established that deterioration of the mechanical properties of steel occurs not only on cathodic but also at some stage with anodic and chemical degreasing. The best results were obtained on anodic degreasing. Increased current density on anodic degreasing leads to decreased loss of springy properties of steel. Optimal current densities at anodic degreasing was calculated at 6a/dm.² Etching springs was conducted in 2–2.5 N solution of HCl. We investigated the influence of added inhibitor PB-8 and applied ultrasonic fields on the change of mechanical properties of springs. On etching with acid without added inhibitor the loss of springy properties amounted to 52 per cent in 20 minutes. For this same time of etching with inhibitor in the acid, the loss of springy properties was 11 per cent, and for a time of etching of 5 minutes was 2 per cent. Applying ultrasonics significantly speeds up the process of etching. In the course of the first minute, etching decreases the springy properties of steel to no noticeable degree. However, on further increase of time of etching there is a sharp fall of springy property. This may be explained by the desorption of inhibitor on the surface of the metal as a result of cavitation, developed in the etching solution on application of the ultrasonic field.

For electrodeposition of zinc different electrolytes were used: cyanide, sulfate, chloride, ammonium, hydrofluoborate. Electrolysis was done at different current densities and also with the use of reversible current and applied ultrasonic fields.

With common electrodeposition of zinc, the smallest change of springy properties occurred in ammonium, hydrofluoborate and sulfate electrolytes, and the greatest lowering of springy properties occurred in cyanide electrolyte. With zinc plating and cyanide electrolyte at different current densities, the minimum loss of springy properties was obtained at current densities of 2a/dm.² Reversing current for zinc plating in cyanide and sulfate electrolytes (with a relatively long cathodic period to anodic of 10:1) impairs the springy property of steel springs.

Using ultrasonic fields for zinc plating with cyanide and acid electrolytes leads to improved springy properties of springs. On electrodeposition of zinc layers by deposition of the metal obviously a drawback is the penetration of hydrogen into the steel. Using an ultrasonic field for zinc plating in cyanide electrolytes, on depositing the layer of zinc to 6μ it is possible to coat a thin coil of spring at a current density of 5a/dm.² This same degree of change of springy properties of the steel is obtained also with zinc plating in sulfate electrolytes without using ultrasonics.

THE INFLUENCE OF ELECTROLYTIC ZINC PLATING ON THE MECHANICAL PROPERTIES OF STEEL

by I. I. Mazos and N. T. Kydryavtsev

1. Electrolytic zinc plating is widely used in all branches of industry for protection from corrosion of steel and cast iron parts. Along with advantages compared to other methods zinc plating by the electrolytic method has serious shortcomings: in the process of electrolysis on the cathode hydrogen is evolved simultaneously with the zinc. Steel easily absorbs hydrogen when it is in atomic form (directly after the discharge of hydrogen ions) as a consequence of which it develops so-called hydrogen embrittlement. A subsequent heating does not always lead to full restoration of mechanical properties, especially in the case of highly brittle steel.

2. It was shown that the susceptibility of steel to hydrogen to a significant measure depends on its chemical composition and structural state. With increased content of carbon and other alloying elements, there is an increased susceptibility of steel to the influence of hydrogen. The higher the temperature of annealing the steel, the less the susceptibility of steel to hydrogenation, and inversely, the lower the temperature of annealing, the steel becomes encrusted, and the more susceptible it is to the action of hydrogen.

3. Penetrating into the metal, hydrogen lowers the durability of the steel, relative to tension and compression, but it also increases the hardness of the steel, making it brittle.

4. One of the most sensitive methods of estimatign the hydrogen embrittlement of steel is a test with a flat sample by bending. For this test, a special apparatus was constructed, surpassing ordinary apparatus in reliability.

5. Chemical degreasing shows no influence on the plastic properties of steel. Cathodic degreasing in alkaline solution leads to visible hydrogenation on high carbon steel U-9 and has little effect on samples of steel 30ChGSA and Armco iron.

On etching in solutions of sufuric acid there occurs a marked depression of the plastic properties of steel. Admixing ChM lowers the hydrogenation of steel and sulfuric acid. Significant weakening of the hydrogenation of steel on etching occurs in hydrochloric acid. Obviously, this shows that these ions retard the diffusion of hydrogen in steel.

6. It was shown that loss of plastic properties of steel on electrolytic zinc plating in cyanide electrolytes is seen as a result of hydrogenation of the steel and shows most abruptly in the initial period of electrolysis.

The dependence "hydrogenation-time" has a parabolic character. The most susceptible to the action of hydrogen evolved in the process of zinc plating is high carbon steel of type U-9 and high durability steel of type 30ChGSA. With increase of cyanide content in the electrolyte the degree of hydrogenation of steel increases.

The degree of hydrogenation of steel is decreased with increase of current density. Added sulfide and glycerine lower the degree of hydrogenation of steel to a very insignificant degree.

7. On zinc plating with noncyanide electrolytes there is found a more significant lowering of hydrogenation of steel than zinc plating in cyanide electrolytes. Hydrogenation of steel decreases in a series of electrolytes: ammonium, sulfate with added dextrin, sulfate, zincate and hydrofluoborate.

8. Besides zinc electrolytes, for the sake of comparison, we investigated cyanide electrolytes for cadmium and copper plating and also acids for tinning, lead plating and chrome plating. In all cases the dependence "degree of hydrogenation-time" had a similar character; the greatest lowering of plastic properties was found in the initial electrolysis. With cadmium plating, as with zinc plating, the lowered plastic properties of the steel was specifically due to hydrogenation. On cadmium plating the degree of hydrogenation of the steel, however, was significantly less than with zinc plating (for similar thickness of coatings). An abrupt fall in plastic properties and also a lowering in fatigue resistance on chrome plating is due not only to hydrogenation of the steel but also in the process of its formation there develops in the deposit a significant amount of internal stress.

9. For eliminating hydrogen embrittlement of zinc plated objects a series of practical measures were taken such as: heating the piece in a vacuum furnace at a temperature of 180–200C or in a drying cabinet at temperatures of 230–250C, substituting cyanide electrolyte with hydrofluoborate, etc.

INVESTIGATION OF THE TENDENCY TO CRACKING OF HIGH STRENGTH STEEL IN THE DEPOSITION PROCESS OF GALVANIC COATINGS

by N. V. Garshina

1. Hydrogenation of steel parts in the process of applying galvanic coatings has an influence on the mechanical properties of the part, to a large degree increasing its embrittlement, increasing the tendency of bolts to bend, etc.

An especially big change of mechanical properties is found in high durability steels (σ_v = 160–180 kg/mm²), which under a stretching tension may destroy itself in the process of applying galvanic coatings. Therefore, the purpose of the work was to investigate the influence of galvanic coatings on the cracking of high durability steel, 30 ChGSNA.

2. For the material of the sample we used bolts and plates of dimensions 100 by 8 by 2mm of steel 30 ChGSNA, tempered and annealed at 200C. Stretching tension was appliedwith a special set-up. In the work we determined the time to crack the plate sample in the process of applying a coating and time of breaking of the plate on tightening it.

3. The influence of the following factors were noted on cracking of high durability steel:

a) thermal treatment
b) state of the surface
c) electrochemical and chemical treatment prior to applying the coat
d) the composition of the galvanic bath.

4. Samples tempered in oil and annealed at 200C with subsequent polishing or grinding showed a larger tendency to crack than samples submitted to isothermal tempering and similar treatment of the surface. Heating up the part after polishing, to temperatures of 230C for the course of three hours decreased the tendency to cracking.

5. The usual electrolytic degreasing process does not cause breaking of the steel.

On etching with acids (in sulfuric acid with added sodium chloride and with hydrochloric acid) high stability steel cracks. Introduction of an inhibitor PB-5 and ChM decreases the tendency of the steel to crack, but does not eliminate it.

6. Taking down non-uniform tensions of the layer, formed on grinding, by means of anodic etching in 60–80 per cent solution of sulfuric acid at a current density of 5–10 a/dm² to a large degree decreases the tendency of the steel to crack in the process of preparing and applying a coat.

7. In the process of zinc plating in cyanide electrolytes there is a period of strong hydrogenation, which leads to cracking tensions of the sample of high durability steel, and breaking of the zinc plated bolt on continued tightening and bending.

8. On zinc plating and acid electrolyte hydrogenation of steel occurs to a much lower degree than in cyanide zinc plating; on zinc plating, the tensions of the sample without previous passivation, no cracking occurs. The quantity of bolts broken upon increased tightening after zinc plating in acid electrolytes amounted to 13 per cent.

9. Cadmium plating in cyanide electrolytes was also less dangerous than zinc plating in cyanide electrolytes. In the process of coating, hydrogenation caused 6.2 per cent of the plates to be broken, on continued tightening 6.6 per cent of the experimental bolts were broken.

10. In nickel plating plates and bolts, hydrogenation practically did not occur. Chemical nickel plating gave especially good results.

11. In the process of chrome plating significant hydrogenation occurred although less than with zinc plating in cyanide electrolytes.

12. The safest procedure for protecting pieces of high durability steel from corrosion was phosphatization followed by a lacquer coating.

V. INCREASING THE CORROSION RESISTANCE OF ELECTROLYTIC COATINGS. CHOICE OF PROTECTIVE COATINGS FOR OBJECTS TO BE USED UNDER TROPICAL CONDITIONS

INCREASING THE CORROSION RESISTANCE OF ELECTROLYTIC ZINC COATINGS BY SURFACE TREATMENT AND THE ALLOYING OF ZINC WITH OTHER METALS

by Prof. N. T. Kudryavtsyev and K. M. Tyotina

1. Zinc coatings, as is known, are good protection against corrosion under atmospheric conditions, but the inherent corrosion resistance of zinc coatings is not always sufficient. In atmospheres with increased humidity, especially with periodic condensation of moisture, zinc coatings tarnish and some times become stained as a consequence of formation of products of corrosion of zinc-hydroxide or carbonate of zinc.

2. For increasing corrosion resistance of zinc coatings, we used chemical treatments or inhibition in chromate solutions with added sulfuric acid, common salt and others. The formation with these of thin chromate films protects the surface of zinc from direct interaction with the corrosive medium and thus it increases its corrosion resistance. But these films have bad resistance to mechanical action and on exposing parts of zinc (after friction, abrasion, etc.) corrosion of the latter proceeds in an atmosphere of increased humidity, as usual. Many parts of steel after zinc plating in cyanide electrolytes have deep lines and surface cracks (for example, on parts with milled threads, etc.) after some time on these places there form barely noticeable spots, products of corrosion of zinc in the form of the hydroxide, which on inspection with the unaided eye seems black in color. Inhibition in a chromate solution does not eliminate this; black points are formed by chromate lacquers and oil films.

3. Good results for protection against corrosion of zinc coatings are given by phosphatization and subsequent treatment with chromate solutions. Phosphatization of zinc plated objects increases the corrosion resistance of zinc coatings and prevents the formation of black spots and micro cracks on the surface of the object.

4. For further surface treatment for increased corrosion resistance of zinc coatings, we tried the method of alloying zinc by adding to it other metals in small quantities. For this purpose, we investigated the conditions of electrolytic deposition of zinc jointly with other metals (in small quantities) from cyanide and ammonium electrolytes. Corrosion experiments showed that additions of some metals improved the corrosion properties of zinc coatings.

THE TECHNOLOGY OF DEPOSITION OF ALLOYS OF Sn-Zn and Sn-Cd AND THEIR CORROSION RESISTANCE TO CONDITIONS APPROXIMATELY LIKE THOSE IN THE TROPICS

by Dr. P. M. Byacheslavov

1. We developed the technology of depositing alloys of Sn-Zn and Sn-Cd from cyanide and hydrofluoborate electrolytes.

2. We investigated the conditions of inhibition of the galvanic alloys Sn-Zn and Sn-Cd in alkaline and acid solutions.

3. We studied the corrosion resistance of the alloys Sn-Zn and Sn-Cd in cell temperatures and moisture and also in a 3 per cent solution of NaCl. We conducted a comparison of data from zinc cadmium, alloys of Zn-Cd and Sn-Cu.

4. It was shown that the alloys Sn-Zn (20–30 per cent Zn) and Sn-Cd (20–50 per cent Cd) have extremely high corrosion resistance and may be recommended for protection of objects from corrosion under severe working conditions.

CHOICE OF PROTECTIVE COATINGS FOR OBJECTS TO BE USED UNDER TROPICAL CONDITIONS

by F. F. Ashogin and Yo. A. Smirnova

1. The basic factors determined by the aggressive conditions of a tropical climate are increased temperature and corresponding humidity, and also changes in temperature conducive to the precipitation of dew. A tropical atmosphere may contain contaminations natural to industrial districts. We showed that these conditions lead to intensification of the corrosive processes in metals and alloys.

2. For the basis of a critical analysis of different methods of testing, simulating tropical conditions, we chose the following set-up of testing; temperature 50 ± 5C, relative humidity 100 per cent, length of time of testing, 8 hr, after this temperatures were lowered to 18–25C at a relative humidity of 100 per cent. The length of time of testing with this process was 12 hr, after which the samples were dried and examined.

3. A systematic investigation was conducted in a chamber working according to the indicated process, established as its goals:

a) A study of corrosion resistance and protective properties of different coatings on steel, aluminum, magnesium and copper alloys.

b) A study of the tendency to corrosion cracking of high durability aluminum and magnesium alloys.

c) A study of the nature of contact corrosion of metals.

d) A comparison of the results obtained to results of other authors.

On the basis of the investigations conducted, we established that low alloyed steel develops a low corrosion resistance.

Rustproof chrome nickel steel (1×18H9T) after polishing develops corrosion resistance (no corrosion developed after 240 days).

It was established that better protection of low alloyed steels is given by cadmium coatings of thickness of 10–20μ.

For parts, working under friction, it is recommended that chrome coatings be of 60 μ thickness. For decorative sections it is recommended there be a triple-layered coating of a thickness not less than 50 μ (Cu-35 μ, Ni-15 μ, Cr-1 μ) with polishing of each coating.

Nickel and tin coatings develop low protective properties. The stability of phosphate films significantly increases on treatment with aviation oil and technical vaseline.

4. The most secure protection of high stability aluminum alloy is polishing and anodizing in sulfuric acid and subsequent treatment in a solution of bi-chromate. The highest corrosion resistance is had by the alloys AMg, AMts and others.

5. For protection of copper alloys from corrosion, the best coatings were tin and silver (10 μ and more). Coating of alloys of tin-nickel at a thickness of 15 μ safely ensure protection from corrosion.

6. On conducting the experiments on samples under tension, it was found that cracking occurred with alloy B-95. Cracking of magnesium alloy VM65-1 did not occur. Steel 30ChGSA, on polishing of its surface has the greatest tendency to corrosion cracking. It is recommended that methods of protection of high durability steel from corrosion cracking be used.

7. We presented experiments on contact of different metals and alloys which showed that the most dangerous contact for alloy ML-5 with oxidized and non-oxidized surfaces is the contact with steel (25, 1Ch18N9T) whereby corrosion on oxidized surfaces is significantly stronger.

8. Experiments with cloth saturated with different fungicides in contact with metals showed that some fungicides caused corrosion of cadmium coatings and decolorized the anodic film on the aluminum alloy.

COMPARATIVE RESULTS OF EXPERIMENTS ON METALLIC MATERIALS AND COATINGS IN LABORATORY CONDITIONS AND ON CORROSION IN STATIONS WITHIN THE CHINESE NATIONAL REPUBLIC

by Prof. V. V. Usov and E. M. Muravyeva

1. Laboratory experiments were conducted on coatings with samples of dimensions 20 by 40 mm in a desiccator over water with a periodic exposure at 45 ± 5C for the course of 8 hr, cooling to room temperature and exposure for the course of 16 hr. By this there occurs condensation of dew. Duplicate experiments were done under the same conditions but in the presence of sulfur dioxide. The first regime simulated tropical humidity-heat atmosphere, the second-tropical conditions of industrial regions.

Atmospheric experiments conducted in the Chinese National Republic: In tropical humidity-heat climate of Canton and the seaside in Shanghai. Samples in the form of plates 50 by 100 mm were exposed in an open area. Periodic descriptions were given of the outer form of the sample and its weight was determined.

2. The results of experimental coatings under laboratory conditions and at stations in Chinese National Republic for the majority of coatings were by evaluating the outer form and especially by change of weight.

3. The experiments showed the durability of chrome plating cadmium coatings on steel and multi-layered coatings of the type copper-nickel and copper-nickel-chrome on steel and to copper under conditions of humidity-heat of a tropical climate. In seaside regions these coatings did not show protective action.

4. Zinc with chromeplated coatings on steel showed satisfactory protection for steel under atmospheric conditions.

ELECTROLYTIC ANTIMONY PLATING

by V. M. Gevorkyan

Thanks to its high physico-chemical properties and significant corrosion resistance coatings of antimony obtained from an antimoniate electrolyte are used widely in technology. Coatings are easily produced with a mirror shine, retaining this shine for a long time, and soldering well to other metals using ordinary solder.

Coatings of antimony may be recommended for:

a) Protection of metals from corrosion under rough corrosion conditions.

b) For protective-decorative coatings with a mirror shine.

c) For the substance of an intermediate layer for multi-layered protective-decorative coatings of copper-antimony-chrome.

d) For coatings of every kind of electrical contact permitting soldering at low temperatures instead of tin and cadmium.

e) For printing radiotechnical diagrams instead of tinning or coating of alloys of tin-lead.

f) For applying on nickel wire and spraying for the purpose of coating special radiotechnical parts.

Baths for antimony plating are extremely simple, easily maintained and controlled, available under the conditions of any galvanic shop.

COMPOSITION OF BATHS

Potassium antimoniate . . . . . 50–70 g/l
Hydrochloric acid
(specific gravity 1.19) . . . . . 3–5 ml/l
(*p*H 1.75–1.9)
Anode cast from pure antimony marked CyO GOST 1089-41

STEPS OF PROCESS

Temperature . . . . . Room
Cathodic Current Density . . . . . 0.5–1 a/dm²
Anodic Current Density . . . . . 0.1–0.25 a/dm

Coatings of a minimum thickness of 2–3 μ are applied on freshly deposited copper. One micron coatings of antimony are deposited at current densities of 0.5 a/dm² for 5.4 min. and at current densities of 1a/dm² for 2.7 min.

Satisfactory coatings may be obtained to a thickness of 200 μ and more.

Electrolytically prepared solutions of calculated quantities of chemically pure potassium antimoniate in distilled water are prepared. Freshly prepared electrolyte has a *p*H range 3–3.5 in dependence on concentration of salt and its purity. For acidification of the electrolyte it is necessary to add hydrochloric acid (chemically pure specific gravity 1.19) from a calculated 3 ml/l of electrolyte. *p*H is determined using a bulb potentiometer LP-5.

Freshly prepared electrolyte is initially worked at a current density of 0.25 a/dm.² The continuation of this treatment depends on the purity of the initial products, from which the electrolyte is made. On preparation of the electrolyte from chemically pure products, it is sufficient to pre-treat the bath for 1–2 hr, on preparing the electrolyte from pure products, 8–10 hr are required.

The technology of applying coatings is analagous to the technology of applying other metallic coatings. Parts are mounted on copper or brass hangers, prepared by coating with common procedures, coating the copper to a thickness of 2–3 μ, rinsed with cold water and screened in a bath, antimony plated with current.

For antimony plating parts with complex configurations, it is recommended that after loading into the tank to give it a "jolt" of current of doubled strength for 4–5 sec.

The parts treated to bright chrome plating or for which it is necessary to give a mirror-like shine are polished by working up with a felt or cotton cloth, with common polishing paste and an abrasive of rouge or French chalk.

Using a rapid method of taking down the polarization curve eliminates the difficulty of determining the equilibrium potential connected with oxidized surfaces of the electrode, and to determine the overvoltage of the evolved antimony in the anitmoniate electrolyte; it equals approximately 550 mv.

It was established also that on electrodeposition of antimony from antimoniate electrolyte, the concentration polarization is almost completely absent and that polarization bears a chemical character.

A study of the properties of the electrolyte showed that the dispersive capacity of the electrolyte with the cell of Haring and Blum, explained by the formula of Field, composed 50–80 per cent and does not yield dispersive capacity like that with a cyanide bath. Cathodic yield per current of the metal attains practically 100 per cent.

A study of the properties of antimony coatings showed that coatings attained in antimonious electrolytes did not have the "classical brittleness" which is had by metals and coatings obtained from other known electrolytes of antimony.

Coatings had durable adhesion to the base metal and elasticity comparable to the elasticity of zinc and nickel coatings.

It was established that the internal tension of the antimony coatings has the character of compression. Tensions of coating are several times less than tensions of nickel coatings.

Hardness of antimony coatings from antimonious electrolytes averaged 15 per cent greater than wares of antimony of better grade.

The durability of antimony coatings is 3.5 times less than zinc and cadmium.

Coatings of antimony of 50 μ after 45 hr at temperatures of -80 and $+100$C gave satisfactory results. The color of the coating remained unchanged.

The porosity of coatings was small and disappeared at 50 μ.

Coatings had high corrosion resistance to corrosive media (sea water). The stability was higher than that of nickel coatings of similar thickness, and in some cases were equal to the stability of cadmium coatings.

VI. ANODIZATION OF ALUMINUM ALLOYS, OXIDIZING OF MAGNESIUM ALLOYS AND STEEL

BASIC MECHANISM OF THE PROCESS OF SOLID ANODIZING OF ALUMINUM ALLOYS

by M. N. Tiokina, F. P. Zalivalov and N. D. Tomashev

1. Solid anodizing differs from ordinary anodizing in solution of sulfuric acid primarily in its low temperatures of electrolyte equal to about zero degrees and higher current densities (I_a = 2.5-5-10 a/dm^2).

2. In the present report we stated some results of our recent work on the mechanism and the basic rules of formation and development of solid anodic oxidation films, using methods of electron microscopy. For comparison we investigated also the development of films obtained by general methods of anodic oxidation in 4N solution of H_2SO_4 at I = 1 a/dm^2 and temperature of 20C.

3. From the data of the literature it is known that oxide films anodically formed in dilute solutions of sulfuric acid consist of densely packed nuclei of oxide in the form of hexagonal prisms. Each nucleus consists of pores, oxide walled pores, and a layer of oxide barrier at the base.

4. Investigations showed that the micro structure of the film on pure aluminum (that is, the quantity of oxide nuclei and pores, the porous section of oxide nuclei and the thick barrier layer on the porous base) established in the course of the first 3–4 sec after applying the anodic current, and further, it does not change even on attaining significant thickness of films in the order of 100 μ (a time of 120 min) if the conditions of anodic oxidation were held constant.

Anodic oxidation films, obtained by usual methods in sulfuric acid contain 940 by 10^6 oxide nuclei and consequently also pores on a 1mm^2 surface. By the above-indicated regime of solid anodizing, a quantity of oxide nuclei (and pores) decreases more strongly the higher the formation voltage; the cross section of this same thickness oxide barrier at the base pore is increased by this more than 2.5 times, which explains the greater hardness of the same film and increased durability against corrosion and mechanical wear.

Analysis of the data obtained was compared with the oscillogram "voltage-time" taken down for the initial stage of anodic oxidation under the same conditions, showed that the thickness of the oxide walls of the pores and oxide barrier on the base pores have the basic "function" formation of strain and composes a corresponding 8 and 10 Å per each volt. This is well in conformity with the data of the literature, obtained under other conditions of anodic oxidation of aluminum in sulfuric acid.

We obtained also in the investigated curve a distribution of pore according to their effective radius. The obtained data permits one to conclude that the diameter of the pore does not depend on the condition of anodic oxidation of aluminum in sulfuric acid and for all the data of the curve, the pores were within the range 106–120Å, whereby only an insignificant number of pores (less than 4 per cent were below 70Å and greater than 140Å in diameter.

5. Use of a method developed in the Institute of Physical Chemistry, Academy of Science, USSR and apparatus for micro manipulation, we removed films to investigate the process of growth of anodic oxidation on parts, of the micro-structure composing the alloys on the base of aluminum. The principal scheme of development of anodic oxidation of films on alloys gives a tetragonal structure.

6. Using the electron microscope to examine a section and other physico-chemical methods of investigation helped to obtain more details disclosing the mechanism of growth of solid film and pointed the way to create an oxide coating having a higher quality.

DEEP ANODIZING OF PARTS FROM ALUMINUM ALLOYS

by I. I. Moroz

1. Aluminum and its alloys, thanks to the presence on the surface of protective oxide films, have good anti-corrosion to the atmosphere, to pure water, and also to oxidizing media. By means of artificially thickening the oxide film one may significantly increase the resistance of aluminum and its alloys to corrosion.

2. In the last year the method of deanodization, developed in the Institute of Physical Chemistry, Academy of Science, USSR, has become widely used. Anodic films, obtained by this method, especially on pure aluminum, give a high degree of hardness, exceeding the hardness of annealed steel. Anodic films on aluminum alloys also have significant hardness, heat resistance, and are firmly linked to the base metal. The thickness of these films is approximately 150 μ for pure aluminum, approximately 60–100 μ for alloys of type AK-4. With such thicknesses of these films, its microporosity leads to high oil capacity and good resistance against wear. Thick anodic films have high corrosion resistance, high electro and thermal insulation properties.

3. In general anodizing of aluminum and its alloys on surfaces of metal-forming films, the thickness attains 12–15 μ. On lowering the temperature of the sulfate electrolytes to -4C and -6C, one may obtain oxide films significantly thicker.

4. The technology of deep anodizing differs from general anodic oxidation in solutions of H_2SO_4 by the steps of the process. On the basis of laboratory investigations and a 5-year production practice, we developed a rational technological process of deep anodizing which may be recommended to other plants.

5. We obtained thick oxide films well able to be polished. Polishing of thick-layered oxides frequently eliminates the effects of the lowered range of fatigue of aluminum alloys, caused by oxidation in sulfuric acid and especially developed in deep (or thick layered) anodization.

6. Industrial use of deep anodizing done at the factory may be recommended to other establishments. It may be set up and operated without large capital outlay. The establishment must provide special automatic equipment to regulate the temperature of the electrolyte.

7. The method of deep anodization permits in many cases substitution of steel parts with significantly lighter aluminum alloys. Undoubtedly, it has very wide use in our equipment and machine construction industry.

NEW METHOD OF CHEMICAL OXIDATION OF MAGNESIUM ALLOYS

by M. A. Timonova and E. B. Katz

1. In industry the presently used solutions for chemical oxidation have a series of deficiencies. These solutions do not have universal action, for not all alloys put out by industry form the films. This makes it necessary to have several solutions in the industry. As a rule, solutions are worked at increased temperatures and at a significant outlay of chromate salt.

2. On the basis of the investigated influence of different compounds entering into the composition of the solution for film forming, it was established that best results were given by solutions of potassium dichromate, potassium aluminum alum and acetic acid.

3. We studied the kinetic growth of the film in solutions of the following compositions:

a) The growth of films with time, as in other solutions containing chromate salts, had a parabolic dependence.

b) With increased content of acetic acid from 3 to 10 ml, the rate of growth of films increased.

c) With increased content of alum from 5 to 15 g/l, the rate of growth of films increased. Further increase of content of alum to 20 g/l contributed to a decreased rate of growth of films.

d) Increased concentration of bichromate from 25 to 100 g/l leads to a decreased rate of growth of films.

4. On the basis of the study of the process of film formation, protective and adhesive properties, the formation of films was set up using the following quantitative compositions of solution and method of oxidation:

Potassium dichromate	30–50 g/l
Potassium aluminum alum	8–12 g/l
Acetic acid	5–7 ml

The temperature of solution is 15–30C, the length of time of oxidation is from 5–10 min.

The solution was worked at constant pH about 3.5. Change in the content of alum of from 5 to 20 g/l, acetic acid from 3 to 10 ml, caused but little change in the pH of the solution.

5. The efficiency of the solution is not less than the standard baths. With one liter of solution it is possible to oxidize 0.5m^2 of metal surface.

6. The solution may be used on measured pieces for oxidation. The dimensions of parts for oxidation practically do not change. The maximum change of dimension is 1 μ.

The formation of films in solution of the above composition are based on oxide compounds of trivalent and hexavalent chrome and magnesium.

7. As the result of the investigation of these thermally stable films, it was established that on periodic heating for the course of 10 days the films were stable to 150C, above this temperature there is a region with some decrease of the protective properties of the film.

We developed a composition of solution to permit oxidation at room temperature, conserving the consumption of chromate salts by three times. Good quality films were obtained on the following alloy base systems: Mg-Mn, Mg-Al-Zn-Mn, Mg-Zn-Zr, and also other alloys.

THE PROBLEM OF THE MECHANISM OF ALKALINE OXIDATION OF STEEL

by A. V. Shroeder and A. G. Arakelov

1. According to the presentations of Prof. Samartseva, oxidation films are formed as a result of a secondary separation process of magnetite in the interactions developed in hot alkaline solutions by ferrite and hypoferrite. More recent works (Zabivaev, Swartz, Krotov and others) contain suggestions of an electrochemical mechanism of formation of oxide films as a result of microelectrochemical oxidation of iron to magnetite.

2. For the purpose of clarifying the mechanism of the process of oxidation a group of brass samples were submitted to electrolytic iron with radioactive baths, and the other in an electrolyte not containing radioiron.

Oxidation was conducted in two solutions: one with a content of 700 g/l NaOH and oxidizer (200 g/l $NaNO_2$ and 50 g/l $NaNO_3$), and in the other was contained 1000 g/l NaOH with no admixed oxidizer. Each of these solutions was used in two ways; first with admixed radioactive iron nitrate, and second without the admixed radio isotope.

After oxidation of the corresponding samples, a determination was conducted of the activity of the oxidized metal and a portion withdrawn and put into a working solution and an ordinary determination done with an indicating meter.

3. The method of tagged atoms showed that the formation of an oxide film with an alkaline-nitrite oxidation of steel occurs basically at the expense of adjacent oxides of iron. For the construction of an oxide film a completely insignificant portion of the oxide of iron is formed from solution by means of crystallization. As a result, there is a lowering of the oxidation capacity of the alkaline solution (for example, in the absence of nitrate and nitrite) there is a significant increase in the role of the process of deposition of the secondary products of corrosion of iron from the solution with the formation of products of oxidation on the surface of the metal.

THE EFFECTIVE PROTECTION OF STEEL AGAINST CORROSION BY DIFFERENT METHODS OF OXIDATION

by V. A. Titov and A. R. Yakubenko

1. The process of oxidizing steel for the purpose of protecting it from corrosion is widespread.

2. Oxide films obtained by different methods have different characteristic protective and other properties.

3. Using weight, chemical, electrochemical, electrical and visual methods of investigation, it was found that the highest anti-corrosion properties were had by films obtained on steel oxidized in aqueous vapor.

4. Further, a series of lowered corrosion-protection actions occurred on films obtained on steel by its oxidation with alkaline and electrochemical methods in molten salts and non-alkaline methods.

5. The temperature of the process of vapor oxidation of steel is 650C, the vapor pressure is 0.3 atm., and the length of time of oxidation was 30 minutes, giving a non-porous black film of oxide of thickness about 10 μ, which for protective properties significantly surpassed oxide films obtained by other methods of oxidation.

6. The method of vapor oxidation of steel did not eliminate imperfections due to the high temperature process lowering the mechanical properties on annealing the steel parts.

7. The method of vapor oxidation may be successfully used for coating objects of construction and instrument grade steel.

a) With the purpose of protecting it from corrosion on combined anticorrosion treatment and its simultaneous high annealing.

b) For increasing its durability.

c) And also in the case where decorative properties of oxidized surfaces are not important when oxide layers are used as the base for applying lacquer coatings.

VII. AUTOMATIC ELECTRONIC APPARATUS FOR CONTROLLING THE COURSE OF GALVANIC COATING

CHEMICAL AND ELECTROCHEMICAL METHODS OF ANALYSIS OF THE ELECTROLYTE AND THE METALLIC COATINGS

AUTOMATIC ELECTRONIC APPARATUS FOR MAINTAINING AN ASSIGNED CURRENT DENSITY, TIME OF COATING, AND TEMPERATURE OF ELECTROLYTE IN GALVANIC BATHS

by Yo. V. Gogish-Klushin

Existing automatic apparatus for maintaining an assigned current density has many shortcomings, making it inconvenient for widespread usage. All of these set-ups utilize the change in deflection of the arrow of a measuring apparatus in the circuit of the control to regulate the electrical regime of the galvanic bath.

On deflection of the arrow of the non-contact galvanometer (Type ERM-47) or ammeter from a given position a switch goes on by a corresponding subsidiary relay, reversing the motion of the moving contact of the regulator (as, for example, LaTRa), while the arrow of the galvanometer is not at the present position.

All constructed automatic apparatus based on regulating the electrical process of the baths, by the deflection of mechanical systems has a series of general drawbacks, the basis of some are:

1) The presence of moving parts and contacts, especially in the measurement circuit, creates an instability in its operations.

2) The impossibility of utilizing the precipitation of metal with a reversible current as part of a regulating circuit.

3) The slowness of the regulating current of the bath and also the high inertia of the measuring

system makes it possible to overrun the desired magnitude and develops self-oscillation in the system.

4) Deep apparatus requires a large current through the circuits of the controller, which in many cases makes it impossible to use them.

All of these deficiencies showed that further development of automation for the maintenance of current density must be done along the lines of utilizing an electronic system. Electronic equipment permits a direct use of the deviation from a given current in a controller to regulate the electrical regime of the baths.

The use of electronic schemes permits:

1) Due to the absence of moving parts and contacts, we can attain a high reliability and stability of the apparatus in the work;

2) A practically inertia-free measuring system permits the use of automation with deposition of metals with reversible current;

3) High sensitivity apparatus permits the use of controllers with very small surfaces requiring little current.

4) With the inertia-less system there is no fear of overloading, permitting the use of rapid regulation of current in the bath;

5) It is simple on the basis of this apparatus to program a regulator for coating with a pulsing current or to change the regime in the process of coating.

For solution of the problem of automatic current regulators with galvanic baths, we utilized the best apparatus for measuring and regulating the temperature, put out by our domestic industry, and these gave the best usable quality.

As the base of the developed electronic automatic apparatus for regulating current in galvanic baths, Type AK was placed into a compensation scheme in which the fall of voltage across a shunt in the circuit of the controller compared to a controller voltage reduces the current density with the potentiometer of the controller. The potential to rebalance falls on entering the electronic amplifier. For an electronic amplifier we used either an ac amplifier with magnetic amplification on the input (as in the automatic type AK-2) or with a vibrotransformer (of automatic type AK-3). The pulsing amplified signal falls on the regulating block—a phase inverter and reversible motor, shifting the moving contact LATRs or similar regulator, until the current in the circuit of the controller is comparable to the preset current. Then the regulator stops.

The automatic AK insures maintaining a given current density on galvanic coating, conducted at current densities from 0.1 to 0.2 dm^2 to several a/dm^2 and higher, with an accuracy to $\pm$ 5 per cent. Any source of current with a regulator may be used to feed the bath; a rectifier with an autotransformer, motor generator with a shunt, or loading rheostat, storage battery, etc., which has adequate power from parts of kilowatts to several kilowatts. The time of deposition may be set up in the range from 3.5 to 45–50 min or more, with an accuracy to 30 sec. At the end of coating, current in the bath is turned off and it goes to a light and sound signal.

The temperature of the electrolyte is measured with a contact thermometer with a magnetic regulator and an intermediate thyratron relay. The temperature is controlled to within 1°. The intermediate relay permits a direct switching on of the heating power to 0.05 KVT, or with a more powerful contactor to switch on a heater of any power.

The automatic AK is made from manufactured standard components put out by our domestic industry. Using manufactured electronic components significantly simplifies and lowers the cost of preparing apparatus and permits a majority of establishments to make their own repairs. The absence of contacting relays and moving parts ensuring reliable work at minimal care in using the set-up.

ELECTRONIC APPARATUS FOR REGULATING THE GALVANIC COATINGS PROCESS PURP-1

by L. M. Mashevich and A. M. Ginberg

A. Purpose and Technical Data

Apparatus to regulate the steps of galvanic coating is intended for accurate maintenance of the technological process of coating, with regard to the thickness of deposited layers, current density, and temperature of the electrolyte, and also with reversible current for electrodeposition of metals.

The apparatus ensures:

a) Establishment to a given thickness in the range from 1 to 35 μk;

b) A measured current density from 0 to 20 a/dm^2;

c) Establishment of a reversal with continued direct current from 0.5 to 13 sec and the reverse current from 0.2 to 5 sec.

d) Establishment of a given temperature of the electrolyte from 20 to 100C.

In the process of electrodeposition, the apparatus:

a) Measures the thickness of coating in microns;

b) Automatically maintains a given current density in the range from 0.2 to 20 a/dm^2;

c) Reverses current strength by 200a;

d) Supports the given temperature of electrolyte to an accuracy of $\pm$ 1.5C;

e) Includes a light signal at the finish of the process on obtaining a given thickness of coating.

B. Description and Principle of Action of the Different Components

PURP-1 consists of the following basic components: A thickness meter with a controller, a density meter with a controller, the following system—the electronic relay for time and contactor, thermoregulator with thermocontroller, a feed component to regulate the scheme and strength of feed to the bath.

The parameters of the given technological process for coating must regulate the corresponding components of the apparatus without any interacting influence one on the other.

The principle of measurement of the thickness of coats is based on the introduction of a resistance in the circuit, one of the resonance loops of a lamp generator. An increased thickness of coat on the foil of the controller (in the form of a closed loop) placed in the bath, disrupts the balance of the sensitive apparatus, the scale of which is graduated in microns, which leads to the declination of the arrow of the apparatus by a corresponding length. For signalling the end of the process, a scheme is used with a photo resistor working on "darkness."

Measurement of current density is essentially by a controller using an ammeter with an added resistor and a shield.

The principle of automatic maintenance of current density is based on the action of a photoelectric following system observing the declination of the arrow of the sensitive apparatus from a given position.

The following system controls the unit feeding the bath, changing the voltage on the bus bar to the bath, according to the position of the arrow of the apparatus in the zone of the desired current density.

The timer relay is an unsymmetrical multivibrator in the grid circuit which contains the elements to regulate time. The contactor is set at different times depending on the treatment, and dc flows through the electronic relay.

The reversal of current in the bath is accomplished by a strong contactor for positive action of the coils of the electromagnet which feed a constant current.

For maintaining the temperature of the electrolyte at a given level, a simple scheme is used with tube 6PIP with an electromagnetic relay in the anode circuit. The thermoregulator used was thermosignaling device type TKMP with movable contacts. On change in temperature from a given one, a break of the contacts of TKMP tube 6PIP closes and switches on the feed to the heater.

For stable working of the components and the relay timer we used an electronically stabilized, rectified voltage to the components of the feeding apparatus.

The power unit feeding the bath is assembled from a standard selenium rectifier of type VCG-3M, an auto-transformer TNN-40, a reductor following system, and it is in the form of a separate component on a hand cart.

C. Components of the Apparatus PURP-1

1. Controller-regulator Apparatus No. 1.
2. Power block No. 2.
3. Controller for thickness and current density.
4. Thermo regulator.
5. Connecting hose.
6. Hose for feeding Apparatus No. 1.
7. Panel with a graduated meter (with timer relay).
8. ZIP

INTERNAL TENSION IN BRIGHT GALVANIC DEPOSITS

by Yo. V. Lizlov and A. G. Samartsev

1. Obtaining bright galvanic coatings directly from the electrolyte is widely done. But the physical and mechanical properties have been studied insufficiently.

2. Using a contractometer we investigated the internal tension in deposited copper and nickel, obtained from the common sulfate electrolyte, and from the electrolytes containing shine-forming additives. The character of the change of tension under the action of additives is similar for both metals.

3. Deposited copper and nickel from electrolytes without additional natural compression tension (metals tend to reduce their volume): for copper—500 kg/cm^2, for nickel—1500 kg/cm^2. The introduction into the electrolyte of small quantities of brightener (naphthalene sulfonate for nickel plating electrolyte, thiocarbamate and gelatin for copper) goes along with increased compression tension. But on an increased concentration of additive the tension decreases and thereby changes its sign.

4. In the process of electrolysis, the layer of liquid adjacent to the cathode decreases in brightening substance, so the rate of its diffusion is insufficient to compensate for loss due to absorption and inclusion in the deposit. The decrease in the layer adjoining the cathode occurs the more strongly than the lower the concentration of additive in the electrolyte, the higher the cathode current density and the lower the temperature of the electrolyte.

The internal tension and other properties of the deposit depend on the concentration of the brightening substance in the electrolyte layer adjoining the cathode. Thus a change in the conditions of electrolysis has a strong influence on the brightness.

DEVELOPMENT OF A METHOD OF ANALYSIS OF HYDROFLUOBORATE ELECTROLYTE

by E. Lerman

1. The basic component of hydrofluoborate electrolyte is hydrofluoboric acid and its salt, the fluoborate. This compound contains in its composition the complex ion $(BF_4)^-$.

2. Methods of analysis of the hydrofluoborate as to content of fluoborate are almost non-existent.

The content of fluoborate is generally determined by the content of fluoride which not always corresponds in fact to the content of all the complex anion fluoborate in a given solution. The anion fluoborate is able to be hydrolized and so along with the anion BF_4^- in solution there are also the anions $BF_3(OH)^-$ and $BF_2(OH)_2^-$.

3. There is a gravimetric method to determine the fluoborate using the organic base nitron.

Nitron (diphenylenedanilodihydrotriazol) precipitates besides fluoborate, nitrate, chlorate, perchlorate, chromate, tungstate, pyrinate. There is no interference from chloride or sulfate. Borate, hydrogen fluoride and hydrofluosilicic acid are not precipitated with nitron.

The time for a gravimetric analysis of fluoborate content is 5 to 6 hr.

4. Besides nitron, the complex anions of fluoborate react with vegetable alkaloids, organic quaternary bases and with bases of the triphenyl methane dyes.

The basic triphenyl methane dyes (methyl violet, malachite green) forms with the complex anions of fluoborate a colored solid phase reaction which may be used to conduct a colorimetric determination.

On the basis of the reaction between the anion fluoborate and the dye methyl violet, we proposed a colorimetric method to determine the content of fluoborate in copper, nickel and iron electrolytes.

5. The accuracy of the gravimetric method of analysis of the electrolytes using nitron is higher than the colorimetric method. In the first case the relative error does not exceed 7 per cent, in the second it attains 10 per cent.

ELECTROCHEMICAL METHOD TO DETERMINE THE ADHESION OF A METALLIC COAT

by A. I. Lipin

1. The majority of presently known methods to determine adhesion of metallic coatings is based on breaking the sample and then studying the parts. In recent times there is a widely circulated electrochemical method to determine adhesion proposed by A. T. Vagranyanom.

Essentially this method consists of determining the active part of the cathodic surface by the magnitude of polarization at the moment of turning on the current.

2. We presented the results of investigation on determining adhesion of zinc to the aluminum alloy AK-4. The magnitude of polarization at the moment of switching on the current, and its subsequent change was determined using a cathode voltmeter and an electron oscillograph. A displacement of the beam of electrons on the screen of the oscillograph was recorded photographically. The electron oscillograph has a sensitivity along the "y" axis of 60 cm/mv, and an internal resistance of 450 R ohm. The cathode voltmeter has an internal resistance of 11 mg ohm.

The determination of potential of the tested electrode is done against a calomel half element. Investigation was conducted on samples of aluminum alloys, pressed into limits with glass. Deposition of zinc onto the samples was done from hydrofluoborate electrolyte at room temperature and current density of 5 a/dm^2, calculated from the geometric surface of the electrode.

3. Photographs of the oscillogram showed the character of change of polarization of the cathode after switching on the current in dependence on time of previous exposure of the sample to the solution without current. From the material presented it follows that with increased time of exposure of the samples to the electrolyte without current, the magnitude of the potential of the electrode at the moment of switching on the current—decreases. This turns one's attention also to the fact that the interval of time from the moment of turning on the current to the moment of setting up the value of the potential is also dependent on the preparation of the surface of the sample.

4. We conducted a series of oscillograms to characterize the jump of potential at the moment of turning on the current with deposition of zinc on the sample, exposed in the electrolyte without current or anodic polarization. It was shown that in the case where there is a suitable preparation of the surface it will attain good adhesion.

The data obtained is evidence that with these conditions we can attain, durable adhesive zinc coatings on top of aluminum alloys.

5. On the basis of the path of the polarization curve $E = f(dk)$ and the result of the oscillographic investigation was constructed a graph of the dependence of the value of activity of the cathode surface on the procedure of initial preparation.

6. The result of electrochemical determination of adhesion of zinc is basically supported by data from the determination of adhesion of coatings by other methods, in particular, cyclic heating and cooling of zinc plated samples.

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MILESTONES OF AES

A PLATING MAGAZINE original feature during this observance fiscal year of the FIFTIETH ANNIVERSARY of its parent, American Electroplaters' Society, Inc.

FROM VJ DAY to mid-June 1950, the United States, though at uneasy peace, nevertheless experienced vicissitudes and growing prosperity unprecedented in stature in American history to that era. Among other manifestations, there were shifts in population—a boom in education—great challenge of science, with particular progress in aviation, electronics, chemicals and medicine. In mid-June 1950, however, the nation was back in combat—a conflict in far-off Korea labeled a "struggle" or "police action" by many though it had earmarks of full-fledged war. This, and a rearming Europe, precipitated shortages in materials reminiscent of 1941.

America's marketplace consequently encountered tight supply of almost every metal and chemical. Nickel and cadmium anodes and salts came under seller allocation—tin anodes and salts rose sharply in price. Need to conserve material became vital, and careful husbanding and management, always important, became an inflexible must. Waste treatment pointed the way to substantial reduction in waste losses—and, through the exposure tests of the American Society for Testing Materials (ASTM), the porosity research of the American Electroplaters' Society (AES) and the microthrowing power studies of the New Jersey Zinc Company, considerable light was shed on the protective value of plated coatings. Despite war and war's harassments, however, AES nevertheless continued to progress in stature and in service.

In 1950, for example, it revised the structure of its Paper Award System. Thereafter, the AES rewarded merit of published technical and scientific works through six competitive annual awards, namely 1) The AES Gold Medal, 2) The AES Silver Medal, 3) The Certificate of Honorable Mention, 4) The Mechanical Finishing Award co-sponsored with the Lea Manufacturing Co., 5) The Chromium Plating Award co-sponsored with the Nutmeg Chrome Co. and 6) The Gold and Gold Alloy Plating Award co-sponsored with Technic, Inc.

In that same period, it cemented a close working relationship with the Ohio River Valley Water Sanitation Commission, particularly with its Metal Finishing Industry Action Committee that formulated plans, assembled data, and cooperated with similar action committees towards preserving the usefulness of our country's natural resources and inland waterways via abatement of stream pollution. AES's Research Program collaborated through its Project No. 2 focussed upon waste-solution analysis.

As a forward step in AES government, moreover, AES launched the first Interim Meeting of the Supreme Society in 1951, this initial meeting being held in Philadelphia in late January. And in 1952, also the year that the Carl E. Heussner Award was created as its highest Paper

Supreme Society, AES's governing council, in action, Cincinnati, May 22, 1958, President Herberth E. Head presiding.

Dr. William Blum, facing, first winner of the AES Scientific Achievement Award, receives accolades of the Supreme Society, Cincinnati, May 22, 1958.

Award, AES took another step forward in assimilating its growth by creating a permanent National Headquarters in the American Building at 443-445 Broad Street in Newark, N. J. In 1954, it filed its Amended Certificate of Incorporation under which it has ever since lived as a New Jersey non-profit educational corporation.

The Korean conflict having finally terminated in mid-July 1953, AES, by year-end 1954, was composed of a global membership numbering some 6700 members.

In that four-year interval between 1951 and 1954, AES had penetrated the Lone Star State in 1951 with a Branch in Dallas-Fort Worth. In 1952, it had entered the Wheat Belt with Branches in Wichita and Kansas City. The next year, it invaded the Northwest by establishing a Branch in Portland and, in 1954, chartered a Branch in Seattle. Aside from adding Eastern Branches in Upstate New York's Capital District and Southern Tier in 1954, it had also implemented its Texas entry by accepting Branches in Houston and San Antonio. Hence as 1954 ended, its network of autonomous Branches numbered 53, consisting of 46 coast-to-coast in the United States, 4 in the Canadian Dominion and 3 "Down Under" in the Australian Commonwealth.

AFTER Korea, America passed through a period of prosperity that made its past economic booms insignificant by comparison. Its affluence was interrupted in 1957-1958, however, by a so-called "recession."

Quantitatively, the American Electroplaters' Society, during the 1955-1958 period, experienced continued progress from practically every standpoint. Its membership, for instance, swelled to nearly 8000 members meaning a 1300 member growth in four years. With the chartering of five Branches since 1955, namely Mississippi Valley (1955); British Columbia, Miami (Florida) and Mohawk Valley (1957) and Blue Ridge (1958), its Branches increased from 53 to 58, consisting of 50 in the United States, 5 in Canada, 3 in Australia at year-end 1958.

Qualitatively, AES in 1957-1958 streamlined for the future by successfully assimilating significant structural and procedural changes and improvements, including change of its fiscal year from April 1-March 31 to July 1-June 30; vesting membership, educational, public relations and other functional responsibility in respective nine-man committees; increasing its Paper Awards from six to eight; inaugurating its "AES Scientific Achievement Award" as its highest honor and tapping, as first winner,

MILESTONES OF AES

Blue Ridge installed as Society's 58th chartered Branch, Roanoke, Virginia, March 28, 1958. Left to right: Branch President T. R. Boggess and then-National President Francis T. Eddy.

that lean, grey, kindly, renowned scientist from the shores of the Potomac—Dr. William Blum.

Its publishing activities, including completion of its Branch Officers Manual, made appreciable strides forward. As a mature and growing technical and scientific Society in a period when quality technical and scientific manpower is an especially vital need of our nation, it continued to enrich technical and scientific knowledge in electroplating, metal finishing and allied arts not only by its research program in American and Canadian universities and foundations and through literature presenting the results of research, but also through technical and scientific papers delivered by experts before its Annual Conventions and before monthly Branch Meetings and periodical Regional assemblies.

IN THE quarter-century from 1933, nadir of America's worst depression, to 1958, our nation passed through one of the most dynamic social, economic, scientific and political periods in our long history.

In that quarter-century, our country successfully fought a global war and, in doing so, accomplished prodigious production feats as the Arsenal of Democracy. On somewhat a smaller scale, our Nation demonstrated again, in the more recent Korean struggle, its gigantic production power.

In that quarter-century, our population skyrocketted from about 122 million in 1933 to some 175 million today. National income swelled to over seven times its 1933 stature by 1958. Our standard of living mounted even higher as goods vaguely visualized in the past, became actualities of the present.

In that quarter-century, for example, television swept to unbelievable development and popularity. Antibiotics, including penicillin, were created as new, potent weapons against disease. Synthetic fibres made notable headway. Jet and turbine engines—vitamins—plastics—high octane gas—synthetic rubber—radar—the proximity fuse—the rocket projectile—atomic power—these and many other advances emerged from obscurity to resounding reality.

Against the backdrop of these miracles of science and engineering and the other factors that have metamorphosed our nation and have made it vastly different than it was when AES's founding fathers shared the vision of Charles H. Proctor in 1909 and formed NEPA, the AES stands today as a monument, in effect, to its farsighted trailblazers of a half-century ago.

Today as it pauses long enough enroute to its Centennial to take stock at its half-century mark, the American Electroplaters' Society is the industry's mature educational society developed, step-by-step through the years, for the advancement of electroplating, metal finishing and allied arts.

It has some 8000 Active, Sustaining and Student Members and Members-at-Large residing not only coast-to-coast in the United States but also in other countries.

Coordinated and serviced by its National Headquarters located in Newark, N. J., the AES currently has 58 autonomous Branches, here and in Australia and Canada, each conducting educational and other Society activities in the common interest for its members.

The AES's educational work includes research projects conducted at the University of Pennsylvania, Columbia University, Ontario Research Foundation, National Bureau of Standards and other such institutions, pinpointed to specific technical and scientific improvements sought in electroplating, metal finishing and allied arts.

Its Annual Convention attracts nearly 2000 members and their families, and the technical papers presented at the educational sessions of its Convention are published annually in a widely sought book titled, TECHNICAL PROCEEDINGS.

Its ABC-rated monthly magazine, PLATING, enriches the technical knowledge of its readers via technical papers and other scientific and technical data. It has a global circulation at present aggregating some 10,000 monthly, and is growing steadily.

The AES's summit governing council, its Supreme Society, is composed of three accredited Delegates from each of the AES's 58 Branches. The elected officers comprise its Executive Board and AES's staff is manned by specialists and practitioners.

In this its Golden Jubilee year, AES faces not only the challenge of today but also of tomorrow. Its hands on the helm are guided by policies many of which were first fashioned by Charles Henry Proctor and his fellow pioneers as far back as 1909 and which, as developed by new generations of able, dedicated men through the years, have withstood the tests of five ensuing decades. The next half-century's record will tell its own full story as to AES's continued effectiveness.

—JOHN P. NICHOLS

Executive Board in session, Detroit, December 6, 1958.

PROCLAMATION

City of Detroit—Executive Office

LOUIS C. MIRIANI
Mayor

AMERICAN ELECTROPLATERS' SOCIETY GOLDEN JUBILEE WEEK

JUNE 15-19, 1959

WHEREAS The American Electroplaters' Society (AES), an Educational Society currently composed of members residing globally, the bulk of whom are respectively grouped in 90 chartered branches in the United States, 5 in Canada and 3 in Australia, is observing its Fiftieth Anniversary, and

WHEREAS AES has for five full decades dedicated itself to the enrichment of knowledge and advancements in electroplating, metal finishing and allied arts, and its educational activities have included a broad research program involving projects conducted at a number of American and Canadian universities and foundations that have fostered and benefitted the public interest, and

WHEREAS AES members are scattered throughout our country's automotive, aircraft, electrical and other industries engaged in metal finishing and, therefore, every individual of our nation comes into contact every day with the myriad of products that have been developed or produced by them, ranging from missiles, aircraft and automobiles to fountain pens, safety pins and other common household products, and

WHEREAS The Society will climax its Golden Jubilee by a large scale Golden Jubilee Convention and Industrial Finishing Exposition, including the Fifth International Conference on Electrodeposition and Metal Finishing that will be held in Detroit, June 15-19, 1959, and that will draw to our municipality the leadership and rank and file of that industry from all over the world:

THEREFORE, I, Louis C. Miriani, Mayor of Detroit, do hereby proclaim the week of June 15-19, 1959, as **AMERICAN ELECTROPLATERS' SOCIETY WEEK** in Detroit, and I urge all the citizens of our community to honor and salute this time-tested enterprise that, nationally is currently observing its Golden Jubilee of public service.

Louis C. Miriani
MAYOR

GOLDEN JUBILEE EDUCATIONAL SESSIONS TO FEATURE 45 INTERNATIONAL PAPERS

The Educational Sessions program of the AES's GOLDEN JUBILEE CONVENTION took another step forward toward finalization when the Editorial Board, in meeting in Detroit, January 23, heard and approved the abstracts of some 45 technical and scientific papers pinpointed for delivery at that Fifth International Conference on Electrodeposition and Metal Finishing.

Presented to the Board, for such consideration, by International Conference Chairman W. L. Pinner, the 45 tentatively approved papers include 24 by United States experts, nine from England, four from France, two from Germany and one each from India, Switzerland, Canada, Australia, Holland and Italy. The program was consequently frozen to these papers, grouped for delivery at eleven sessions as specified elsewhere in this issue of PLATING.

Among these eleven sessions, three are beamed to organic coating. Nine sessions will be held at the Statler-Hilton Hotel, two at Detroit's Artillery Armory, site of AES's Fifth Industrial Finishing Exposition, another bright facet of the versatile GOLDEN JUBILEE CONVENTION.

Leadoff feature among the 45 papers to be heard at the International Conference is the first "William Blum Lecture," titled; "Education and the Electroplater," to be delivered by the first "AES Scientific Achievement Award" winner, namely Dr. William Blum. AES Research will be represented by papers from Projects No. 14 and No. 17.

Sessions chairmen named at that Editorial Board meeting include electroplating and metal finishing leaders from the United States, England, Canada and Australia, these being Dr. T. P. Hoar, England; G. Ross Davidson, Canada; Leslie L. Diveley, United States; William M. Phillips, United States; Clarence H. Sample, United States; Ralph D. Wysong, United States; Dr. S. Wernick, England; A. W. Wallbank, England; A. A. B. Harvey, England; Dr. Abner Brenner, United States and Ezra A. Blount, United States.

Chairman John P. Nichols presided at the Editorial Board meeting and Rodney Leeds served as secretary. Those present beside Mr. Pinner included Donald C. Austin, Dr. Abner Brenner, Robert A. Ehrhardt, James H. Lindsay, Dr. Abraham M. Max, William H. Safranek and William M. Tucker. The Board's final meeting before the GOLDEN JUBILEE CONVENTION will be held at National Headquarters, March 20, 1959.

AES NEWS

RESEARCH PROGRAM HAD QUARTERLY INSPECTION AT CHICAGO MEETING

With its finger constantly on the pulse of the vital AES Research Program that currently embodies seven active projects on electroplating and metal finishing subjects at respective American and Canadian universities and foundations, the AES Research Committee, with Dr. Russel E. Harr its chairman presiding, heard and acted upon a full progress report as to Projects from James D. Thomas, vice chairman for research. The Committee's meeting was held at the Conrad Hilton Hotel, Chicago, January 30. Others heard as to projects were District Supervisors Clyde Kelly and Clarence H. Sample.

Among other business transacted, the Committee received the status report of its functional subcommittee headed by Dr. D. Gardner Foulke as to the AES Research Program exhibit that will be an element of the AES's FIFTIETH ANNIVERSARY LOUNGE, a feature of the AES's GOLDEN JUBILEE Convention and Industrial Finishing Exposition in Detroit, June 15–19, 1959.

The Committee also heard from John P. Nichols, its secretary-treasurer and PLATING's publisher, as to the Research Program section that will be a mainstay of PLATING MAGAZINE's April 1959 issue.

Appointed as its Nominating Subcommittee for 1959 were Dr. Russel E. Harr, chairman, and Messrs. Leland M. Morse and Leslie L. Diveley. By Research Committee action, moreover, the vice chairman for research will soon appoint respective subcommittees to explore and recommend as to the desirability of initiating three specific new projects, probably at university level.

From Vice Chairman for Finance Kergan Wells, the Committee was presented with a report as to the status of Sustaining Memberships from which the AES Research Program mainly derives its annual financial sustenance. Need for an intensive drive to increase such company memberships through active work by all AES echelons, particularly at Branch level, became evident from that report. Consequently, Sustaining Membership promotion momentum will be expanded under impetus of the Research Committee's Regional Finance Subcommittee which will be reorganized and implemented under Mr. Wells' leadership. There will be collaboration with the AES's standing Membership Committee through Mr. Wells.

AES FOUNDING TO BE COMMEMORATED AT BALTIMORE-WASHINGTON

Commemorating the FIFTIETH ANNIVERSARY of the birth in New York on Saturday, April 10, 1909, of the National Electro-Platers Association of the United States and Canada (NEPA), transformed in 1913 into today's American Electroplaters' Society (AES), the Baltimore-Washington Branch will conduct a full-day's GOLDEN JUBILEE observance at the Statler-Hilton Hotel in the nation's capital, Saturday, April 11, 1959. Fare for the large expected audience will include both an afternoon educational session and an evening program packed with attractions.

A feature of the evening's banquet will be the appearance, as the Branch's honored guest, of Justus A. Stremel of the New York Branch, one of the AES's surviving founding fathers. It is interesting to note that at that very April meeting five decades before at which NEPA was formally organized, the same Justus A. Stremel was appointed a member of the Printing Committee along with George B. Hogaboom and Harry C. Bernard, the latter being another of the Mother Branch's living founders. Both Mr. Stremel and Mr. Bernard are still active in the affairs of their beloved New York Branch. F. F. Pierdon of the Baltimore-Washington Branch, another NEPA stalwart, will also be present and will discuss "Plating Fifty Years Ago."

At that same GOLDEN JUBILEE banquet, National President Herberth E. Head will receive the traditional "pot" of the Order of Past Presidents except that as the Society's head during its FIFTIETH ANNIVERSARY, the "pot" that will be presented to him by the Baltimore-Washington Branch will be gold-plated and will carry the inscription, "AES GOLDEN JUBILEE, Herberth E. Head, President, 1959." Among many invited guests will be all of the AES's national officers.

Dr. Hugh L. Dryden, Deputy Administrator of the National Aeronautics and Space Administration will be the evening's featured speaker. He will develop the subject, "Some Problems of the Space Age."

In the afternoon phase of Baltimore-Washington's GOLDEN JUBILEE celebration, the Chairman of the Educational Program will be the renowned Dr. William Blum, first winner of the AES Scientific Achievement Award, the Society's highest scientific honor.

Speakers will include Dr. Abner Brenner, chief, Electrodeposition Section, National Bureau of Standards discussing, "Deposition of Unusual Metals"; John G. Beach, Battelle Memorial Institute presenting, "Plating on Unusual Metals," and Dr. W. A. Wesley, International Nickel Company, covering, "Causes and Remedies for the Corrosion of Nickel Chromium Coatings."

Created in 1929 and observing its own Thirtieth Anniversary in 1959, the Baltimore-Washington Branch's distinctions include hosting the 43rd Annual Convention in 1956. Despite seasonal crowding of Washington hotels, it is reportedly possible to get accommodations at the Statler-Hilton if the reservation is made before March 28. Write direct to Arthur G. Pierdon, 12 L Street, S. F., Washington 3, D. C., general chairman of the impressive commemorative.

ELECTROPLATING EDUCATION SUBJECT OF FIRST BLUM LECTURE

"Education and the Electroplating" industry is the title of the first annual "William Blum Lecture" ever to be delivered. It will be presented at the Opening Session of the International Conference on Electrodeposition and Metal Finishing at the AES's GOLDEN JUBILEE CONVENTION at the Statler-Hilton Hotel, Detroit, Michigan, Monday afternoon, June 15, 1959 by Dr. William Blum, first winner of the AES Scientific Achievement Award, the Society's highest scientific honor.

At the Grand Opening Session of the GOLDEN JUBILEE CONVENTION to be held in the forenoon of that same day, the winner of the second AES Scientific Achievement Award will be announced and he will deliver the second "William Blum Lecture" at the AES's Los Angeles Convention in July 1960.

THE LUNCHEON THAT CULMINATED "AES GOLDEN JUBILEE WEEK IN GRAND RAPIDS"

1) Custodian Donald N. Schants proudly displays Grand Rapids Branch's four-decade old AES charter to Third Vice President Chester G. Borlet and First Vice President Ralph D. Wysong. 2) Part of the dais. Left to right: Branch First Vice President Donald Smith, National Executive Secretary John P. Nichols, First Vice President R. D. Wysong, Mayor Stanley J. Davis and Branch President Paul A. Waalkes. 3) First Vice President Wysong accepts the key to Grand Rapids from Mayor Davis in behalf of National President Herberth E. Head. 4) Part of the large luncheon audience. 5) Another view of the dais. Left to right: Mr. Borlet, Speaker Fred I. Noble, Chief Police Chemist Carl R. Kempe, Dr. Richard B. Saltonstall, Branch Librarian Orville D. Hoxie. 6) Among Grand Rapid's guests. Left to right: Harry Buchanan, Bob Dudley, H. D. McLeese, AES Past President M. C. Caldwell, Branch Publicity Chief Tom Henner. (Photos courtesy Lee F. Phillips, Hanson-Van Winkle-Munning.)

MAYOR PRESENTS GRAND RAPIDS KEY AT BRANCH'S GOLDEN JUBILEE CELEBRATION

Culminating "American Electroplaters' Society Golden Jubilee Week in Grand Rapids" (January 12–17, 1959) observed in that municipality by Mayoralty Proclamation, Mayor Stanley J. Davis presented the key to Grand Rapids to AES before a large audience attending the GOLDEN JUBILEE Luncheon of the AES's Grand Rapids Branch held at the Pantlind Hotel, Saturday, January 17. In behalf of National President Herberth E. Head, prevented at the last moment from attending, the key was accepted by AES First Vice President Ralph D. Wysong.

Besides Mayor Davis' welcome and presentation, the luncheon, over which Branch President Paul A. Waalkes presided, also heard AES Third Vice President Chester G. Borlet's key speech discussing AES affairs, particularly the Society's GOLDEN JUBILEE.

From National Executive Secretary John P. Nichols, the Branch received the Society's and Executive Board's, 1) congratulations upon its own recently concluded Fortieth Anniversary, 2) commendation upon the extent and quality of its community relations and, 3) thanks for its sponsorship, with the Metal & Thermit Corporation, of the new John J. Hanney Memorial Paper Award.

A hit of the luncheon was the illustrated talk, "Scientific Aids in Crime Detection," delivered by Chief Police Chemist Carl R. Kempe, head of Grand Rapids' Crime Laboratory.

The GOLDEN JUBILEE Luncheon was preceded by a well-attended forenoon Educational Session featuring the able talk on "Modern Practices in the Art of Bright High Speed Cyanide Copper Plating," presented by Fred I. Noble of Lea-Ronal, Inc. Branch Librarian Orville D. Hoxie, who arranged that program, acted as chairman. On display was not only the framed AES charter of the Grand Rapids Branch of which Donald N. Schants is custodian, but also the framed original of Mayor Davis' Proclamation.

The Branch's GOLDEN JUBILEE day's festivities ended with a banquet, floor show and dance attended by a record number of the Branch's members and guests, including Mayor Davis, three AES National Officers, three AES Past Presidents and many visitors from other AES Branches. Backdrop of the stage was the golden flag of the jubilee. Audience received a gold-colored printed program, and the ladies, a handsome perfume atomizer in addition.

Aiding Branch President Waalkes and Branch First Vice President D. F. Smith (general chairman) in staging the day's events, well-covered by the local press, were Branch Second Vice President T. C. Henner (publicity); Orville D. Hoxie (educational); R. O. Blackford (entertainment); John Dykstra (tickets); W. J. Griffin (favors); Branch Secretary E. J. Krook (program) and Branch Treasurer C. J. Byrns, Jr., (finance).

DUAL SESSIONS AT EMPIRE STATE REGIONAL

The Fifth Annual AES Empire State Regional Meeting will be held in truly Golden Jubilee manner on Saturday, April 11, 1959 at the Hotel Peter Stuyvesant in Buffalo, N. Y.

Empire State Branches participating in these annual affairs are Rochester, Syracuse, Southern Tier, Capitol District and Mohawk Valley.

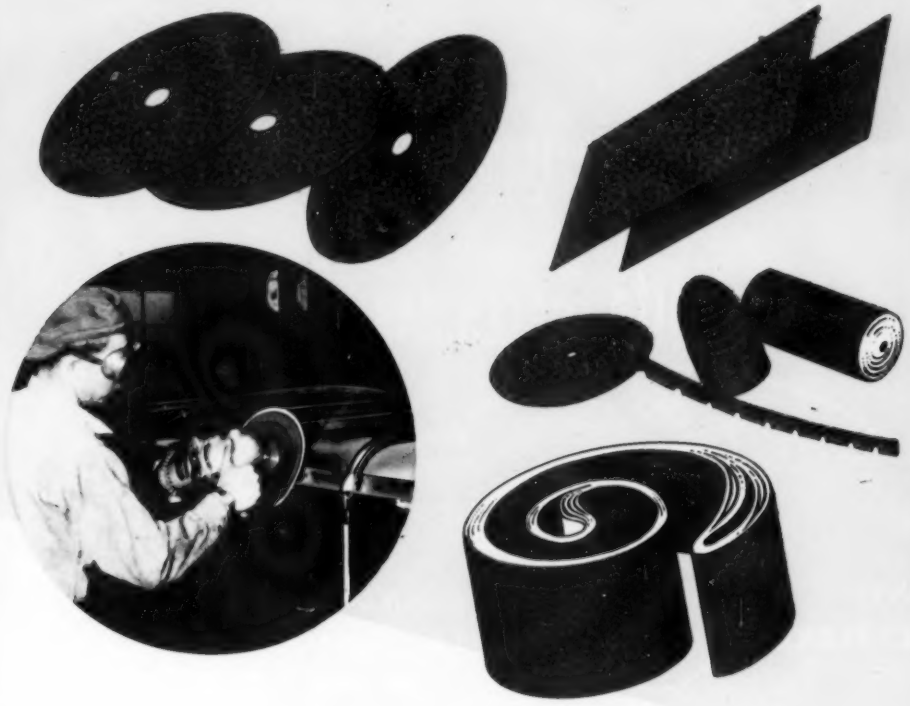
Frank W. Rudolph, president of the Buffalo Branch is general chairman of the meeting.

The Educational Session will begin at 2:00 p.m. and will again be divided into two sections—plating and organic finishing. Two speakers will be featured at each section. Plating Section: I. Laird Newall, Henry Souther Engineering Co., whose subject will be "The Role of Stress in the Electrodeposition of Metals" and Manuel Ben, General Motors, who will speak on "Hard Chromium Plating." Organic Finishing Section: Fremont L. Scott, Metal and Thermit Corp., who will speak on "Developments in the Field of Organic Finishing." Everett W. Linton, Duralac Chemical Corp. will discuss "Multicolor Enamels."

Following the separate sessions, a film provided by Alcoa on "Color and Texture in Aluminum Finishes" will be shown to a joint meeting.

For the ladies there will be a luncheon at 1:30 p.m. followed by a demonstration of floral arrangements.

For evening entertainment there will be a banquet at 7:30 p.m., followed by dancing.



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Methods for Testing Thickness of Electrodeposits, II & III—By H. J. Read & F. R. Lorenz	*Serial 27* *Project 7* *$1.35*
Porosity of Electrodeposited Metals—By N. Thon, D. G. Kelemen, L. Yang, S. Yang, D. Dean	*Serial 28* *Project 6* *85 Cents*
The Analysis of Electroplating Solutions for Major Constituents—By E. J. Serfass & M. H. Perry	*Serial 29* *Project 2* *90 Cents*
Effect of Basis Metal Condition on Plating, I & II—By A. E. R. Westman & A. F. Mohenheim	*Serial 30* *Project 14* *$1.10*
Effect of Surface Finishing of Nonferrous Base Metals on Protective Value of Plated Coatings—By G. J. Kahan, W. W. Macchia, J. M. Fairbank	*Serial 31* *Project 4* *45 Cents*
How the Small Electroplater Can Treat Cyanide Plating Waste Solutions with Hypochlorites—By Barnett F. Dodge and Walter Zabban, Yale University, New Haven, Connecticut	*Serial 33* *Project 10* *50 Cents*
Effects of Impurities and Purification of Electroplating Solutions, IX, X & XI—By Dr. D. T. Ewing, Dr. A. J. Smith & Dr. W. O. Dow	*Serial 34* *Project 5* *50 Cents*
Cleanability and Oil Spreading Rates—By H. B. Linford & P. E. Grubb	*Serial 35* *Project 12* *50 Cents*
The Nature, Cause and Effect of the Porosity in Electrodeposits, I & II—By Fielding Ogburn, Asaf Benderly and Margaret Hilkert	*Serial 36* *Project 13* *$1.00*
Microthrowing Power, A Literature Search—By Esther B. Leffler and Henry Leidheiser Jr.	*Serial 37* *Project 17* *75 Cents*
The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating IV—By M. H. Jones, Chih-Yeu Lu and J. Zajdowski	*Serial 38* *Project 14* *$1.25*
Mechanical Finishing of Metal Surfaces—Bibliography—By C. E. Kennedy, J. E. Fritts, R. S. Modjeska, L. E. Weeg & R. V. Twyning	*Serial 39* *Project 18* *50 Cents*

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TIN, ball anodes, per lb approximately	$1.05

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PLATINUM, per troy oz	$50 to $55
RHODIUM, per troy oz	$120 to $125
SILVER, New York, cents per troy oz	90.375

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BORIC ACID, 100 lb bag N. Y.	10.50
CADMIUM OXIDE, 100 lb drum per lb	$1.45
CAUSTIC SODA, 100 lb, N. Y.	8.50
CHROMIC ACID, flake type, 100 lb drums	30.44
COPPER CYANIDE, 100 lb drum	65.90
COPPER SULFATE, 100 lb bags, per cwt	22.75
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SODIUM CYANIDE, domestic, f o b N. Y., 200 lb drums	23.70
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ZINC CYANIDE, 100 lb	60.75
ZINC OXIDE, American process, lead free, 100 to 500 lbs	15.5

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Both sides of the table at the Chicago meeting of the Midwestern Regional Council on Jan. 31.

MIDWAY'S AES REGIONAL COUNCIL ACTIVATED

At a meeting held at the Conrad Hilton Hotel, Chicago, January 31, six Midwestern AES Branches ratified the bylaws of the AES's new Midwestern Regional Council and therefore officially created that regional body as the Society's fifth such official area entity. Signatory Branches include the Chicago, Milwaukee, Mississippi Valley, Rockford, St. Joseph Valley and St. Louis Branches.

Following the formal organization of the Midwestern Council to take its place beside such other official AES area groups as the Dixie, Tri-State, New England and Empire State bodies, the infant regional group unanimously elected Leslie L. Diveley (Milwaukee) as chairman; Eugene Roth (St. Joseph Valley) as vice chairman and Paul Glab (Chicago) as secretary-treasurer.

Among the activities contemplated for undertaking by the new Midwestern group are 1) a platers school; 2) a possible Midwest Speakers Bureau, 3) a yearly rotating Regional Annual Meeting and Educational Session and others.

To assist the chairman in leading the regional body, the region adopted a resolution calling for the appointment by him of a Standing Advisory Committee composed of one member from each of the six currently signatory Branches. In addition, the group authorized Chairman Diveley to appoint a qualified Convention Committee to conduct the AES National Convention that will be held in Milwaukee under its aegis in 1962 with the Milwaukee Branch as Host Branch.

Beside Branch Delegates to the January 31 organization meeting, conferees included, by invitation, National President Herberth E. Head; First Vice President Ralph D. Wysong and National Executive Secretary John P. Nichols. The Council's next meeting is scheduled for Milwaukee, April 25.

Attending Udylite luncheon prior to Annual Educational Session, left to right, M. M. Beckwith, Clarence H. Sample, Joseph Corre, Paul Glab, L. J. George, R. Scott Modjeska, Myron B. Diggin, Simon P. Gary, Richard B. Saltonstall.

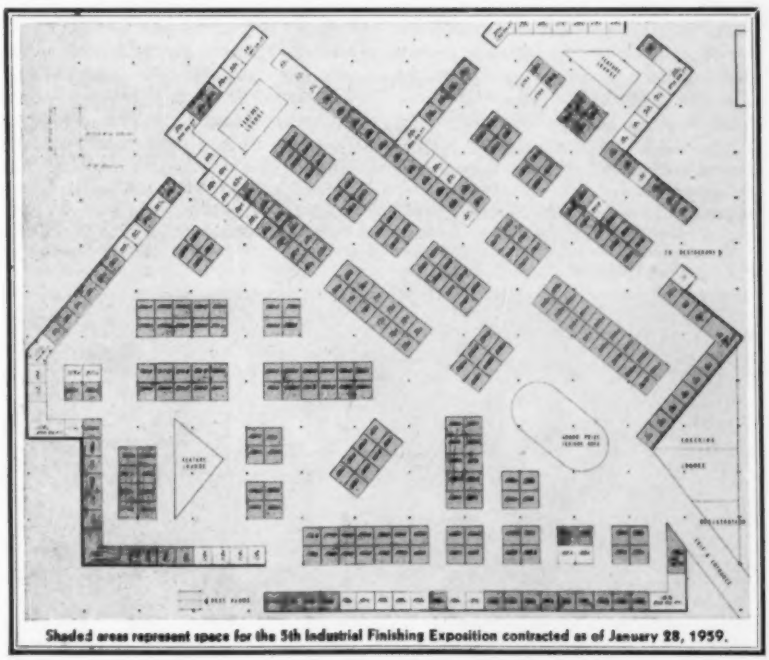
CHICAGO BRANCH STAGES LAUDED GOLDEN JUBILEE EVENT

Mounting one of the most impressive educational sessions in its long history, AES's Chicago Branch contributed to the cumulative momentum of the Society's FIFTIETH ANNIVERSARY by staging a lavish program at the Conrad Hilton Hotel, Saturday, January 31. Attended by a record assembly of Branch members, including guests from various parts of the country, the Chicago phase of AES's GOLDEN JUBILEE was climaxed by a gala banquet, floor show and dance that will long be remembered in the nation's Midway.

With Joseph Corre as program chairman and Simon P. Gary as moderator, the Educational Session held in the afternoon of that GOLDEN JUBILEE day spotlighted a panel that included Myron B. Diggin, Hanson-VanWinkle-Munning, on "Nickel Electroforming"; Clarence H. Sample, International Nickel Company, on "Protective Value of Nickel and Chromium in Bright Deposits"; Dr. Richard B. Saltonstall, The Udylite Company, on "Modern Bright Nickel as a Metal Finishing Tool" and Dr. M. M. Beckwith, The Harshaw Chemical Company, on "Duplex Nickel Plating."

Branch President R. Scott Modjeska opened and closed the well-attended session and National President Herberth E. Head addressed the assembly briefly on Society affairs. Among those introduced were two of the Society's living Honorary Members, namely H. A. Gilbertson of Chicago and John Lockerbie of St. Joseph Valley. Mr. Gilbertson was National President in 1934–1935. Other AES Past Presidents stemming from the Midway present included Clyde Kelly.

The Banquet whose floor show was surely Broadway grade filled the Conrad Hilton's vast Main Ballroom although purposely restricted this year. R. F. Ledford headed the Banquet Committee that included Rudolph Hazucha, Christopher Marzano, Joseph Andrus, Edward Stanek and Lawrence George. Indefatigable Paul Glab, Branch secretary, headed the arrangements and financial management of the affair. Among other features of that eventful day was the Udylite Company's traditional reception and luncheon.



Shaded areas represent space for the 5th Industrial Finishing Exposition contracted as of January 28, 1959.

(1) Part of the attentive audience at the 50th Anniversary Annual Educational Session of the New York Branch. (2) Branch President Edward B. Saubestre, Walter L. Pinner, Dr. D. Gardner Foulke, Dr. Henry Brown, all three speakers at the Educational Session; Arthur Carlson, presiding officer at the session. (3) Counter clockwise from lower left, National Past President Francis T. Eddy, Mrs. Wesley, National Second Vice President W. Andrew Wesley, Mrs. Nichols, David X. Clarin, National Executive Secretary John P. Nichols, National President Herberth E. Head, Mrs. Saubestre, Branch President Edward B. Saubestre, Mrs. Eddy. (4) Cocktail Party, hosted by MFSA. (5) Golden Jubilee Banquet. (6) Counter clockwise from lower left, Ralph F. Scholbe, Mrs. Leeds, Rodney Leeds, Walter L. Pinner, Arthur Carlson, Mrs. Stremel, Justus A. Stremel, Harry Bernard and his son.

MOTHER BRANCH MARKS ITS GOLDEN JUBILEE WITH GALA KNICKERBOCKER CELEBRATION

Founder Charles Henry Proctor must have beamed with pride and joy as, from high Valhalla, he viewed the brilliant GOLDEN JUBILEE Educational Session and Banquet commemorating its FIFTIETH ANNIVERSARY staged by the AES's New York Branch, at New York's Statler-Hilton Hotel, Saturday, February 7, 1959. It was the capital event to be expected from the Society's oldest Branch in the world's foremost metropolis.

AES's day in the sun in Knickerbocker started with a top-grade Educational Session programmed by Educational Chairman Arthur E. Carlson featuring three of the industry's experts, namely Dr. Henry Brown, Udylite; Dr. D. Gardner Foulke, Hanson-Van Winkle-Munning and Walter L. Pinner, McGean Chemical Co. A record crowd was present.

Against the background of the Statler's handsome Penn Top Room, a number of the industry's sources of supply hosted an elegant reception that was a hit of the day's fare. Then followed the sumptuous banquet in the Terrace Room that broke New York Branch records for all-round excellence. And heading the versatile bill of entertainment was none other than lovely Trudy Adams, darling of Ed Sullivan's TV show.

Branch President Edward B. Saubestre, in the tradition of the Mother Branch's Proctors and Hogabooms and other stalwarts of AES's past, presided at the afternoon session and was spokesman at the banquet. Guests of honor included Founding Fathers Harry Bernard and Justus A. Stremel. William Schneider, the third among them was unable to be present. Guests of honor also included National President Herberth E. Head and three other National Officers. Nearby Branches were well represented, particularly Newark, Boston, Baltimore-Washington, Philadelphia, Bridgeport, Waterbury, Detroit, many others.

Joseph Rembecki was the event's general chairman and George Hermann staged the well-received Ladies Program. Other major subchairmen included Richard Hartmann (entertainment); Angelo Amatore and Albert Fusco (banquet); Philip Bruno (advertising) and Milton Nadel (financial).

Seated, left to right, Mrs. Stremel, New York Branch Founding Fathers Justus A. Stremel and Harry Bernard. Standing, Arthur Carlson, AES National Third Vice President W. Andrew Wesley, National President Herberth E. Head, Past President Francis T. Eddy, Past President Walter L. Pinner.

It gives me a great deal of pleasure on behalf of the City of New York to extend to the members of the American Electroplaters' Society warm greetings on the occasion of the organization's Fiftieth Anniversary.

Your organization has contributed much to the growth of our City in the past fifty years and I am sure will continue helping even more in making our community a better place in which to live.

With all best wishes for a most successful celebration.

Robert F. Wagner
Mayor
New York City

SIXTH INTERIM MEETING AND DIXIE REGIONAL A GOLDEN JUBILEE HIGHLIGHT

Rated as one of the finest programmed and staged AES Meetings of its kind yet held, the two-day combination Sixth Interim Meeting of the Supreme Society and First Dixie Regional Educational Sessions and Banquet held in Atlanta, Georgia, February 13–14, 1959 deserves a foremost place among AES GOLDEN JUBILEE events. Beside excellent educational and relaxational fare provided by the AES's Southeastern Branch, host of the Dixie Region, it also featured a fruitful Meeting of the Supreme Society despite drain upon better attendance created by inclement weather. February 13–14 were proclaimed as "American Electroplaters' Society GOLDEN JUBILEE Days in Atlanta" by Mayor W. B. Hartsfield. A gold gavel was presented by the Dixie Region to the Supreme Society at the events' sumptuous Farewell Banquet. The golden printed souvenir program was another hit of the delightful two-day event. Above is picture story, with fuller detail due to appear in April PLATING. (1) Dais at the opening session of the Dixie Regional. Left to right, Claude J. Nalley, president, Southeastern Host Branch; Francis T. Eddy, national past president; Dr. W. Andrew Wesley, national second vice president; Herberth E. Head, AES national president; Myron M. Randman, Dixie Regional general chairman; Ralph D. Wysong, national first vice president; Chester G. Borlet, national third vice president; John P. Nichols, national executive secretary; Rev. Father King, who pronounced the invocation. (2) Participants in an Educational Session: Mr. Randman, Henry Strow, Dr. Abner Brenner, Edward T. Logan and James D. Thomas. (3) R. T. Gore delivering paper at one of the Educational Sessions; seated at his left, Mr. Randman, Frederick Fulforth and Mrs. Jerita D. Wilson, educational chairman. (4) Attentive Educational Session audience. (5) Dr. Harold J. Weisner, technical speaker; Mr. Randman, Mrs. Jerita D. Wilson and D. J. Griffin, who introduced the speaker. (6) Informal meeting of the trustees of MFSA with members of the AES executive board. In this picture of part of the room are Hugh D. McLeese, John P. Nichols, Robert M. Norton, M. M. Beckwith, Ralph D. Wysong, Francis T. Eddy, Herberth E. Head. Also at the meeting were Fred P. Green and Earl W. Couch. (7) Frederick Fulforth, Coordinator, welcomes the Sixth Interim Meeting to Atlanta. National President Head is at his right. (8) A few of the intent Delegates at the Interim Meeting. (9) The Delegates/Alternates luncheon. (10) Exposition Chairman Howard J. McAleer presents impressive progress report on the Exposition. Seated, Messrs. Wesley, Eddy, Head and Wysong. (11) National President Head receives for the AES, a gold plated gavel from Southeastern Branch President Nalley, on behalf of the Dixie Regional Group. Seated, Mr. and Mrs. Randman. (12) President Head responding to presentation and addressing the banqueteers. Seated, Mrs. and Mr. Wysong. (13) The Banquet head table. Mrs. George W. Taylor, Frederick Fulforth, Mrs. Fulforth, Earl W. Couch, Mrs. Couch, John P. Nichols, Mrs. Borlet, Chester G. Borlet, Mrs. Wysong, Ralph D. Wysong, Myron M. Randman, Mrs. Randman, Walter E. Crawford, executive vice president of Atlanta Convention Bureau; Mrs. Ballard, Rev. J. Ballard, Dr. W. Andrew Wesley, Francis T. Eddy, Mrs. Nalley, Claude J. Nalley. Also at the head table but not in the picture, Mrs. Wesley and George W. Taylor.

CONVENTION CHAIRMEN

Mrs. Alice Pillsbury
Ladies

Manuel Ben
Exposition Vice Chairman

Wright W. Wilson
General Chairman

Howard J. McAleer
Exposition Chairman

Walter L. Pinner
Educational Chairman

Dr. R. B. Saltonstall
Co-Chairman
International Conference

AMERICAN ELECTROPLATERS' SOCIETY'S GOLDEN JUBILEE CONVENTION AND INDUSTRIAL FINISHING EXPOSITION

SPONSOR: AMERICAN ELECTROPLATERS' SOCIETY, INC. (AES)
(Address: American Building, 443-445 Broad Street, Newark 2, N. J.)

HOST BRANCH: AES DETROIT BRANCH

GOLDEN JUBILEE CONVENTION:

- **Dates:** JUNE 15–19, 1959
- **Headquarters Hotels:** STATLER-HILTON HOTEL, Detroit, Michigan
  SHERATON CADILLAC, Detroit, Michigan
- **Registration:** TWENTY DOLLARS ($20.00) PER PERSON (Male or Female)
- **Leadership:** WRIGHT W. WILSON, General Chairman
  (Address: 1570 Anita, Grosse Pointe, Michigan)
- **Educational Sessions:** FIFTH INTERNATIONAL CONFERENCE ON ELECTRODEPOSITION & METAL FINISHING
  Dates: JUNE 15–19, 1959
  Leadership: WALTER L. PINNER, Chairman
  (Address: McGean Chemical Co., 1040 Midland Building, Cleveland 15, Ohio)
- **Ladies Program:** MRS. GEORGE A. PILLSBURY, Chairman
  (Address: 1104 Nottingham Road, Grosse Pointe Park, Michigan)

FIFTH INDUSTRIAL FINISHING EXPOSITION:

- **Site:** ARTILLERY ARMORY, Oak Park, Michigan
- **Transportation:** SHUTTLE BUS (Free Service) To and From Statler-Hilton Hotel
- **Exhibitors:** INDUSTRY'S SOURCES OF SUPPLY
- **Dates:** JUNE 16–19, 1959
- **Hours:** June 16 and 17: 10 a.m.–9 p.m.; June 18: 10 a.m.–4 p.m.; June 19: 10 a.m.–6 p.m.
- **Leadership:** HOWARD J. McALEER, Exposition Chairman
  (Address: Formax Manufacturing Co., 3171 Bellevue, Detroit, Michigan)
  MANUEL E. BEN, Vice Chairman
  (Address: Research Staff, General Motors Corp., Box 118, North End Station, Detroit, Michigan)
- **Exhibit Space Sales:** MARVIN C. JOHNSON, Exposition Director
  (Address: George P. Johnson Co., 23171 Groesbeck at Nine Mile Road, Warren, Michigan)
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Transportation

TENTATIVE PROGRAM

GOLDEN JUBILEE CONVENTION AND INDUSTRIAL FINISHING EXPOSITION AMERICAN ELECTROPLATERS' SOCIETY, INC.

HOTEL STATLER-HILTON, DETROIT, AND ARTILLERY ARMORY, OAK PARK, MICHIGAN JUNE 15-19, 1959

This is a TENTATIVE PROGRAM as of February 1, 1959. Additions and modifications will be made monthly until finalized

SUNDAY, JUNE 14

9:00 a.m.	Executive Board Meeting (All Day)	Hq. Room (Parlor B)
1:00–8:00 p.m.	Registration	Foyer
3:00–5:00 p.m.	Ladies Tea	English Room
4:00 p.m.	Credentials Committee Meeting	Parlor B
4:00 p.m.	AES Scientific Achievement Award Committee Meeting	Parlor F
8:00 p.m.	Golden Jubilee Get-Together Party	Grand Ballroom

MONDAY, JUNE 15

9:00 a.m.–5:00 p.m.	Registration	Foyer
10:00 a.m.	Grand Opening, Golden Jubilee Convention	Grand Ballroom
11:00 a.m.	Business Meeting, Supreme Society	Grand Ballroom
12:00 noon	Branch Secretaries' Luncheon	English Room
12:00 noon	Speakers' Luncheon	Parlor E
2:00 p.m.	Opening Educational Session A, Fifth International Conference on Electrodeposition and Metal Finishing	Grand Ballroom
2:30 p.m.	Editorial Board Meeting	Parlor E
4:30 p.m.	Order of Past Presidents, Business Meeting	(To be announced)
6:30 p.m.	Past Presidents' Dinner	(To be announced)
7:00–9:00 p.m.	Registration	Foyer
9:00 p.m.	AES Golden Jubilee Open House (Sponsored by Metal Finishing Suppliers Association)	Sheraton-Cadillac Ballroom

TUESDAY, JUNE 16

8:00 a.m.	Research Committee Breakfast	Parlor F
8:00 a.m.	Speakers' Breakfast	(To be announced)
9:00 a.m.–12:00 noon	Registration	Foyer
9:00 a.m.	Educational Session B, International Conference	Grand Ballroom
9:00 a.m.	Educational Session C, International Conference	Michigan Room
9:00 a.m.	Research Committee Meeting	Parlor F
9:00 a.m.	Educational Committee Meeting	Parlor E
9:30 a.m.	Plant Visit, Ford Motor Company (Rouge Plant), Dearborn, Michigan	Bus from Statler-Hilton
10:00 a.m.–9:00 p.m.	Industrial Finishing Exposition	Artillery Armory
12:00 noon	Branch Librarians' and Educational Committee Luncheon	English Room
12:00 noon	Speakers' Luncheon	(To be announced)
2:00 p.m.	Opening Ceremony, Fifth Industrial Finishing Exposition	Artillery Armory
2:00 p.m.	Research Committee Meeting	Parlor F
2:30 p.m.	Educational Session D, International Conference	Artillery Armory

WEDNESDAY, JUNE 17

8:00 a.m.	Membership Committee Breakfast	Parlor F
8:00 a.m.	Speakers' Breakfast	Parlor E
8:30 a.m.	Golden Jubilee Golf Tournament (Sponsored by the Metal Finishing Suppliers' Association)	Pine Lakes Country Club
9:00 a.m.–12:00 noon	Registration	Foyer
9:00 a.m.	Public Relations Committee Meeting	English Room
9:00 a.m.	Membership Committee Meeting	Parlor F
9:00 a.m.	Educational Session E, International Conference	Grand Ballroom
9:00 a.m.	Educational Session F, International Conference	Michigan Room
10:00 a.m.–9:00 p.m.	Industrial Finishing Exposition	Artillery Armory
4:00 p.m.	Golden Jubilee Outing	Artillery Armory Grounds

THURSDAY, JUNE 18

8:00 a.m.	Speakers' Breakfast	Parlor F
9:00 a.m.–12:00 noon	Registration	Foyer
9:00 a.m.	Business Meeting, Supreme Society	Michigan Room
9:00 a.m.	Educational Session G, International Conference	Grand Ballroom
9:00 a.m.	Plant Visit, General Motors Technical Center, Warren, Michigan	Bus from Statler-Hilton
10:00 a.m.–4:00 p.m.	Industrial Finishing Exposition	Artillery Armory
12:00 noon	Speakers' Luncheon	Parlor F
2:00 p.m.	Business Meeting, Supreme Society	Michigan Room
2:30 p.m.	Educational Session H, International Conference	Grand Ballroom
7:00 p.m.	Golden Jubilee Banquet, Floor Show and Dance	Statler-Hilton

FRIDAY, JUNE 19

8:00 a.m.	President's Breakfast (National Officers and Wives)	President's Suite
8:00 a.m.	Speakers' Breakfast	Parlor F
9:00 a.m.	Executive Board Meeting	Parlor B
9:00 a.m.	Educational Session I, International Conference	Michigan Room
9:00 a.m.	Educational Session J, International Conference	Grand Ballroom
10:00 a.m.–6:00 p.m.	Industrial Finishing Exposition	Artillery Armory
12:00 noon	Speakers' Luncheon	Parlor F
2:30 p.m.	Educational Session K, International Conference	Artillery Armory

TENTATIVE PROGRAM

INTERNATIONAL CONFERENCE

on

ELECTRODEPOSITION AND METAL FINISHING

THE EDUCATIONAL SESSIONS PHASE OF

GOLDEN JUBILEE CONVENTION, AMERICAN ELECTROPLATERS' SOCIETY

HOTEL STATLER-HILTON, DETROIT, and ARTILLERY ARMORY, OAK PARK, MICHIGAN

JUNE 15-19, 1959

MONDAY, JUNE 15

2:00 p.m. Educational Session ..... Grand Ballroom

SESSION A

Chairman—Dr. T. P. Hoar, *England*

THE WILLIAM BLUM LECTURE—EDUCATION AND THE ELECTROPLATING INDUSTRY
by Dr. William Blum, *United States*

TECHNICAL ASPECTS OF PREFINISHED METAL
by Dr. S. Wernick, *England*

DEVELOPMENT AND APPLICATION OF ULTRASONIC CLEANING
by J. Zucker, *Switzerland*

EXPERIMENTAL STUDIES OF THE ELECTRODEPOSITION OF METALS IN NARROW CREVICES
by Dr. Henry Leidheiser Jr. and Mrs. Lucille B. Garmon, *United States*

TUESDAY, JUNE 16

9:00 a.m. Educational Session ..... Grand Ballroom

SESSION B

Chairman—G. Ross Davidson, *Canada*

A BLACK CHROMIUM PLATING PROCESS
by Dr. A. Kenneth Graham, *United States*

LEVELING POWER OF COPPER SULFATE BATHS WITH COMPLEXING ADDITION AGENTS
by Dr. Eugenio Bertorelle, Dr. I. R. Bellobono and Dr. A. Scarati, *Italy*

PLATING ZINC ON STEEL FROM PYRO PHOSPHATE SOLUTION—A PILOT PLANT INVESTIGATION
by U. F. Marx and D. Povey, *England*

ELECTRODEPOSITION OF NICKEL ALLOYS FROM THE PYRO PHOSPHATE BATH
by Dr. T. L. Rama Char, *India*

9:00 a.m. Educational Session ..... Michigan Room

SESSION C

Chairman—Leslie L. Dively, *United States*

CHEMICAL CONVERSION COATINGS
by Robert F. Ayres, *United States*

THE METAL SURFACE CONVERSION COATING AS A PAINT BASE
by Dr. Robert C. Gibson, *United States*

THE ACCELERATED WEATHERING OF ORGANIC FINISHES
by A. A. B. Harvey, *England*

SURFACE TEXTURE: ITS INFLUENCE ON ORGANIC FINISHING
by Dr. Walter Stein and D. H. Lloyd, *England*

2:30 p.m. Educational Session ..... Artillery Armory

SESSION D

Chairman—William M. Phillips, *United States*

THE INFLUENCE OF THE PHYSICAL METALLURGY AND MECHANICAL PROCESSING OF THE BASIS METAL ON ELECTROPLATING—FERROUS METAL CONDITIONS AFFECTING THE DURABILITY OF WATTS NICKEL DEPOSITS
by Dr. Maurice H. Jones, Chih-Yeu Lu, A. F. Mohenheim and J. Zajdowski, *Canada*

THE MECHANISM OF MECHANICAL POLISHING AS RELATED TO THE NATURE OF POLISHED SURFACES
by L. E. Samuels, *Australia*

OUTDOOR CORROSION RESULTS WITH CHROMIUM-NICKEL-CHROMIUM PLATE
by Dr. Henry Brown and Max Weinberg, *United States*

IMPROVED CORROSION RESISTANCE FOR ELECTROPLATED ZINC DIE CASTINGS
by Dr. Charles L. Faust, Hugh R. Miller and William H. Safranek, *United States*

WEDNESDAY, JUNE, 17

9:00 a.m. Educational Session ..... Grand Ballroom

SESSION E

Chairman—Clarence H. Sample, *United States*

CORROSION TESTING OF ELECTRODEPOSITED COATINGS
by F. L. LaQue, *United States*

EXPERIENCE WITH THE USE OF THE CORRODKOTE TEST
by Donald M. Bigge, *United States*

SULFUR DIOXIDE ACCELERATED CORROSION TEST—TESTING CONDITIONS AND EQUIPMENT
by Dr. J. Edwards, *England*

EXPERIENCE WITH THE USE OF THE ACCELERATED ACETIC ACID SALT SPRAY TEST
by Cleveland F. Nixon

9:00 a.m. Educational Session ..... Michigan Room

SESSION F

Chairman—Ralph D. Wysong, *United States*

STATISTICAL DESIGN AND ANALYSIS IN THE APPLICATION OF PLASTISOLS
by M. D. Levin, *United States*

WATER-SOLUBLE COATINGS FOR METAL FINISHING
by Robert A. Boller, *United States*

EPON RESINS IN THE ELECTROPLATING INDUSTRIES
by H. W. Howard, *United States*

VINYL DISPERSION COATINGS
by Myron Perez, *United States*

THURSDAY, JUNE 18

9:00 a.m. Educational Session ..... Grand Ballroom

SESSION G

Chairman—Dr. S. Wernick, *England*

THE EFFECT OF FLOW RATE AND CURRENT DENSITY ON THE ELECTROLYTIC REMOVAL RATE OF IRON AND COPPER FROM A WATTS NICKEL SOLUTION
by Dr. Abraham M. Max and M. L. Whitehurst, *United States*

CHROMIUM IN CYANIDE SOLUTIONS AND ITS REMOVAL
by Dr. Erich Laue, *United States*

ELECTROLESS COPPER PLATING
by Dr. Edward B. Saubestre, *United States*

SOME ASPECTS OF THE CORROSION OF DECORATIVE PLATED COATINGS
by Dr. Frederick A. Lowenheim and William H. Rowan, *United States*

2:30 p.m. Educational Session ..... Grand Ballroom

SESSION H

Chairman—Ezra A. Blount, *United States*

EUROPEAN BRIGHT ANODIZING PRACTICE
by A. W. Brace, *England*

HYDRATION OF ANODIC OXIDE FILMS
by M. S. Hunter, P. F. Towner and D. L. Robinson

ANODIZING PROCESSES FOR THE PRODUCTION OF VERY THICK ALUMINA FILMS
by R. Segond, P. Lelong and J. Hérenguel, *France*

DEVELOPMENTS IN THE SPHERE OF SURFACE TECHNIQUES FOR ALUMINUM AND ITS ALLOYS —PROCESSES AND MATERIALS
by H. Lattey, *Germany*

FRIDAY, JUNE 19

9:00 a.m. Educational Session ..... Michigan Room

SESSION I

Chairman—A. W. Wallbank, *England*

ELECTROCHEMICAL TECHNIQUE IN MODERN METALLOGRAPHY
by Dr. Pierre A. Jacquet, *France*

THE PRESENT STATE OF ELECTROLYTIC POLISHING IN EUROPE
by Robert Mondon, *France*

THE EFFECT OF SHOT-PEENING AND OF GRINDING ON THE FATIGUE STRENGTH OF CHROMIUM PLATED HIGH STRENGTH STEEL
by R. A. F. Hammond and C. Williams, *England*

SOME CHEMICAL POLISHING PROCESSES—THEIR MECHANISM AND THEIR APPLICATION
by Dr. H. Spahn, *Germany*

INFLUENCE OF VARIOUS SURFACE TREATMENTS ON THE RESISTANCE TO FATIGUE OF TWO HIGH-RESISTANCE ALUMINUM ALLOYS
by Gaetan Abadie and Georges Vidal

9:00 a.m. Educational Session ..... Grand Ballroom

SESSION J

Chairman—A. A. B. Harvey, *England*

THE EFFECT OF STEEL PRETREATMENTS ON THE PERFORMANCE OF WATER THINNED COATINGS
by R. A. Williams, *United States*

VINYLS IN MODERN INDUSTRIAL COATINGS
by W. H. McKnight, *United States*

PREVENTION OF TARNISHING OF SILVER AND COPPER BY MEANS OF CHROMATE PASSIVATION
by Dr. P. Baeyens and J. L. Melse, *Holland*

CHROMIC ACID ANODIZING CHARACTERISTICS OF WROUGHT ALUMINUM ALLOYS
by George E. Best, J. G. Hecker Jr., John W. McGrew and R. V. VandenBerg

2:30 p.m. Educational Session ..... Artillery Armory

SESSION K

Chairman—Dr. Abner Brenner, *United States*

BARREL PLATING WITH SPECIAL CONSIDERATION TO PROTECTION OF THREAD DIAMETERS
by A. W. Wallbank, *England*

DUCTILITY IN PLATED COATINGS
by Dr. Harold J. Read, *United States*

GRAIN SIZE CONTROL IN ELECTROFORMING
by H. Denis Hughes

PLATED METALS FOR USE IN SELECTIVE HEAT TREATING
by R. Scott Modjeska, *United States*

Hotel Reservation Request

American Electroplaters' Society

The Fifth International Conference
on
Electrodeposition and Metal Finishing

THE GOLDEN JUBILEE CONVENTION
and
Industrial Finishing Exposition

DETROIT, MICHIGAN, JUNE 14–19, 1959

MRS. DOROTHY GARRETT
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AES Member?_____
YES OR NO

(Please print or type)

1st CHOICE: HOTEL_____ 3rd CHOICE: HOTEL_____

2nd CHOICE: HOTEL_____ 4th CHOICE: HOTEL_____

ACCOMMODATIONS DESIRED: RATE DESIRED:

_____ Room(s) with one bed for one person (Single) ..... $_____ to $_____

_____ Room(s) with twin beds for two persons (Twin) ..... $_____ to $_____

_____ Room(s) with one bed for two persons (Double) ..... $_____ to $_____

_____ Suite(s) parlor and one bedroom ..... $_____ to $_____

_____ Suite(s) parlor and two bedrooms ..... $_____ to $_____

ARRIVAL TIME: Date_____ Hour_____ DEPARTURE TIME: Date_____ Hour_____

LIST NAMES OF ALL PERSONS WHO WILL OCCUPY EACH ROOM:

Name Street Address City and State

_____

_____

_____

_____

_____

_____

_____

CONFIRM RESERVATION TO: Name_____

Company_____

Street Address_____

City_____ Zone_____ State_____

DETROIT CONVENTION HOTELS (Daily Rates, Subject to Change)

	Singles	Doubles	Twins	Suites
Detroit-Leland	$6.00–$11.50	$ 9.00–$14.50	$10.50–$18.00	$22.00–$40.50
Park Shelton	7.50– 16.00	11.50– 20.00	12.50– 20.00	25.00– 50.50
Pick-Fort Shelby	5.50– 11.00	7.50– 13.50	9.50– 15.00	21.00– 40.50
Sheraton-Cadillac	7.00– 16.00	12.00– 19.50	13.85– 20.00	28.00– 54.00
Statler Hilton	6.50– 13.50	12.00– 16.50	12.50– 20.00	24.00– 95.00
Tuller	5.00– 12.00	8.00– 12.00	9.00– 14.00	12.00– 30.00

Please give ALL of the information requested and mail this form to the Detroit Convention and Tourist Bureau. All reservations must be cleared through the Housing Committee.
Blocks of rooms have been allocated for our use in the hotels listed. The Housing Committee must have the names of all persons who will occupy each room. No block reservations will be made.

Placement will be made in the order received. Your choice of hotels will be followed if rooms are available. Otherwise, assignment will be made to best possible advantage elsewhere. You will receive a confirmation directly from the hotel. If you desire accommodations in a Detroit hotel not listed, please so indicate.

IF YOU HAVE NOT ALREADY MADE YOUR HOTEL RESERVATIONS, FILL OUT AND MAIL PROMPTLY

you are invited to attend the

5TH INDUSTRIAL FINISHING EXPOSITION

SPONSORED BY THE AMERICAN ELECTROPLATERS' SOCIETY IN CONJUNCTION WITH ITS GOLDEN JUBILEE CONVENTION

EXPOSITION HOURS

TUESDAY and WEDNESDAY	THURSDAY	FRIDAY
June 16 and 17	June 18	June 19
10 A.M. to 9 P.M.	10 A.M. to 4 P.M.	10 A.M. to 6 P.M.

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JUNE 15-19
1959

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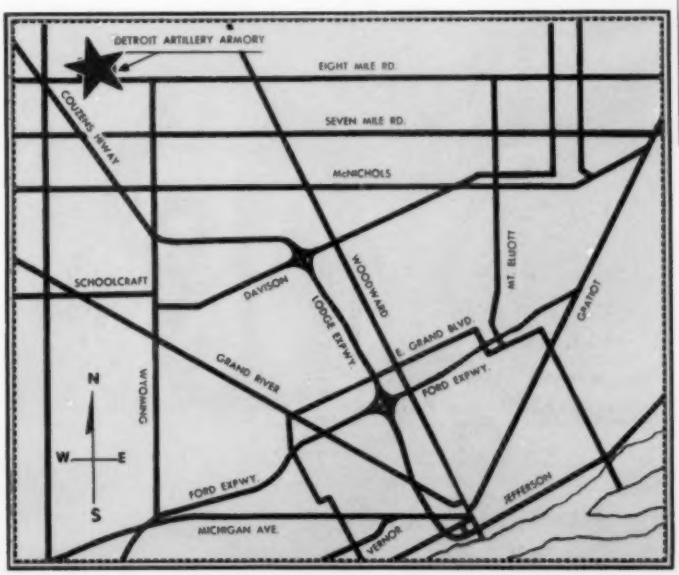
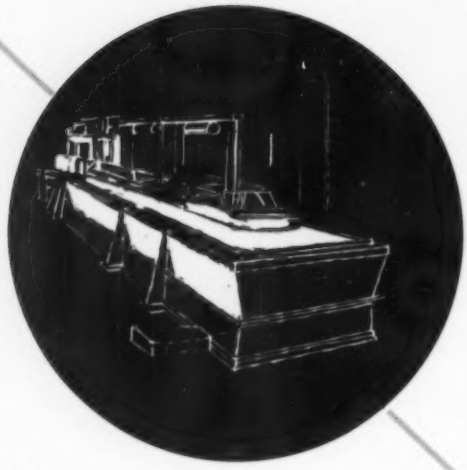


YOU WILL SEE THE FUTURE

Anodes and chemicals



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HUNDREDS OF OUTSTANDING EXHIBITS

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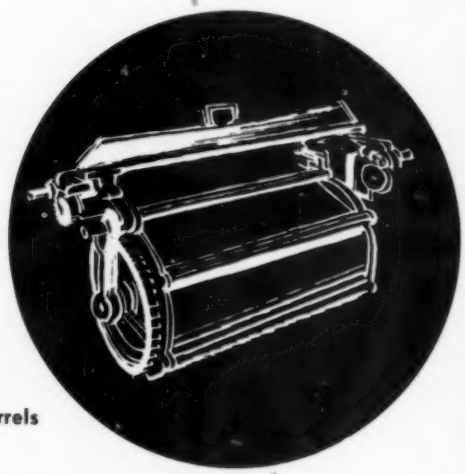
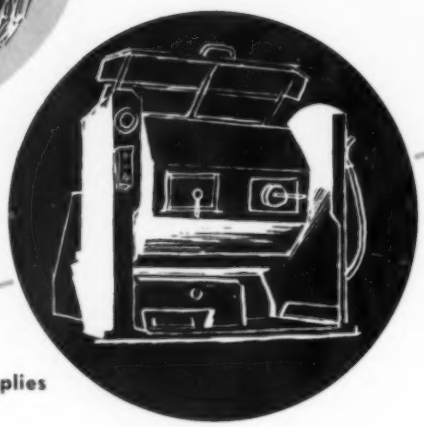
Rectifiers and generators



Tumbling barrels

IN INDUSTRIAL FINISHING

Buffs and compounds



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equipment and supplies

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Everything is being done to make this Exposition the most educational and enjoyable event ever held.

Latest research findings
and developments

Filtering equipment

YOU CAN'T AFFORD TO MISS IT!!

Plan now to join your fellow executives, engineers and plating room personnel at this memorable Exposition. June 15 through 19, 1959.

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YOU WILL PROFIT IN MANY WAYS BY ATTENDING THIS EXPOSITION

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Branson Ultrasonic Corp.
Bruce Products Co.
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The Chemical Corp.
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Cleveland Process Co.
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Conversion Chemical Corp.
Dalic Metachemical Ltd.
Davies Supply & Mfg.

Dean Products, Inc.
Thermo-Panel Division
Deering, Milliken & Co., Inc.
Detrex Chemical Industries
E. I. du Pont de Nemours & Co.
Eaton Chemical & Dyestuff Co.
Electronic Rectifiers
Finish Engineering Co., Inc.
Formax Manufacturing Corp.
G. S. Equipment Co.
G. S. Plastic Co.
Garfield Buff Co.
General Chemical Division
Allied Chemical & Dye Corp.
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Industrial Finishing
Practical Publications, Inc.
Industrial Instruments, Inc.

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Kraft Chemical Co.
Kushner Electroplating School
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The Mc Gean Chemical Co.
Metal Finishing Magazine
Metal & Thermit Corp.
Michigan Buff Co., Inc.
Michigan Chrome & Chemical Co.
Minnesota Mining & Manufacturing Co.
Murray-Way Corp.
National Association of Metal Finishers
Nordson Corporation
Oakite Products, Inc.
Pennsalt Chemicals Corp.
Phillips Manufacturing Co., Inc.
Plating Magazine
Pockrandt, Inc.
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Rampe Manufacturing Co.
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Robe, Inc.
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S & C Manufacturing Co.
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Drainage Equipment
Dryers
Filters and Pumps
Generators
Grinding supplies and equipment
Heating methods and equipment
Materials Handling Equipment
Motors, Blowers and Fans
Organic Materials and Coatings
Pipes, Fittings, Nozzles and Valves
Plant Construction, Layout and Engineering
Purification Methods
Racks and Rack Coatings
Recovery Methods
Rectifiers
Safety Procedures and Equipment
Tanks and Linings
Testing Devices
Ventilation and Exhaust Systems
Waste Disposal Equipment

LISTEN AND LEARN FROM THESE INTERNATIONALLY KNOWN SPEAKERS

SUBJECT	NAME	BUSINESS AFFILIATION	COUNTRY
Influence of Basis Metal	Dr. M. H. Jones	Ontario Research Foundation	Canada
European Bright Anodizing Practice	A. W. Brace	Aluminum Laboratories, Ltd.	England
Experiences with the use of the Sulphur Dioxide Test	Dr. J. Edwards	The British Non-Ferrous Metals Research Association	England
Shot Peening and Baking Effect on Chromium Plated Steels	Dr. R. A. F. Hammond	Past President, Institute of Metal Finishing	England
A critical Study of Accelerated Weathering of Organic Finishes	A. A. B. Harvey		England
Grain Size Control in Electroforming	A. D. Hughes		
Pyro-Phosphate Zinc Plating	U. R. Marx		
Comparison of British and U. S. Methods of Organic Finishing	Dr. W. Stein & D. H. Lloyd	Wilmot Breeden Limited	England
Barrel Plating with special consideration to Protection of Thread Diameters	A. W. Wallbank		England
Problems Encountered in the Application of Pre-coated Steel	Dr. S. Wernick	Ionic Plating Company, Ltd.	England
Electropolishing in Metallography			
Status of Electropolishing in Europe	Pierre A. Jacquet	Consultant, Secretary, Past Pres.	England
Developments in Coating of Aluminum and its Alloys	Robert Mondon	Institute of Metal Finishing	
Chemical Polishing	H. Guinsberg	Societe Jacquet-Hispano Suiza	France
Passivation of Metals		Societe Jacquet-Hispano Suiza	France
Pyrophosphate Systems	H. Spahn		Germany
Accelerated and Exposure Tests on Nickel-Chromium Plated Aluminum	P. Baeyens	Institut Fur Werkstoffkunde	
Development and Application of Ultrasonic Cleaning	T. L. Rama Char	Indian Institute of Science	Germany
Conversion Coatings	F. Sacchi		Holland
Experiences with the use of the Corrodkote Test	J. Zucker		India
The William Blum Lecture	R. F. Ayres		Italy
Water Soluble and Water Reducible Coatings for Metals	D. M. Bigge	Oakite Products, Inc.	Switzerland
Gas Plating	Dr. William Blum	Chrysler Corporation	United States
Corrosion Studies	R. A. Boller		United States
Finishing Zinc Die Castings	E. R. Breining	Archer-Daniels-Midland Company	United States
Surface Preparation for Organic Finishes	Dr. Henry Brown		United States
Black Chromium Plating	Dr. Charles Faust	The Commonwealth Engineering Co. of Ohio	United States
Epoxy Resins	Dr. R. Gibson	The Udylite Research Corporation	United States
Purification of Cyanide Solutions	Dr. A. K. Graham	Battelle Memorial Institute	United States
Importance of Corrosion Testing	H. W. Howard	Parker Rust Proof Company	United States
Microthrowing Power	W. P. Innes	Graham, Savage & Associates	United States
Statistical Design and Analysis in the Application of Plastisols	F. L. LaQue	Shell Chemical Corporation	United States
Bronze as a Protective Undercoat for Decorative Finishes	Dr. Henry Leidheiser, Jr.	MacDermid Incorporated	United States
Vinyl Coatings for Metals	M. D. Levin	International Nickel Company	United States
Impurities in Plating Solutions		Virginia Institute for Scientific Research	United States
Plated Metals for use in Selective Heat Treating	F. A. Lowenheim	General Electric Company	United States
Experiences with the use of the Accelerated Acetic Acid Salt Spray Test		Metal & Thermit Corporation	United States
Vinyl Dispersion Coatings	W. H. McKnight		
Studies related to ductility	Dr. Abraham Max	Bakelite Corporation	United States
	R. Scott Modjeska	RCA Victor-Record Division	United States
Silicone Metal Protectants		Scientific Control Labs, Inc.	United States
Finishing of Aluminum	C. F. Nixon		
Organic Finishing—Not announced		General Motors Corporation	United States
	M. Perez		
	Dr. H. J. Read	Metal & Thermit Corporation	United States
	E. Saubestre	The Pennsylvania State University	United States
	Dr. S. Sterman	Sylvania Electric Products, Inc.	United States
	R. V. Vanden Berg	Union Carbide Corporation	United States
	R. A. Williams	Aluminum Company of America	United States
		Rinshed-Mason Company	United States

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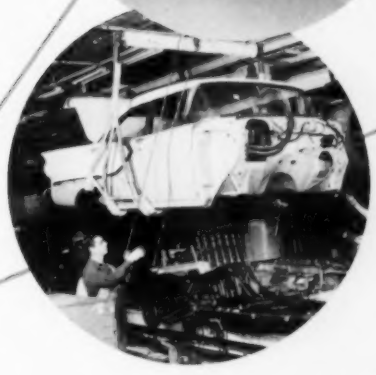
Mrs. Dorothy Garrett, Housing Committee, A. E. S.
Detroit Convention and Tourist Bureau
626 Book Bldg., Detroit 26, Michigan



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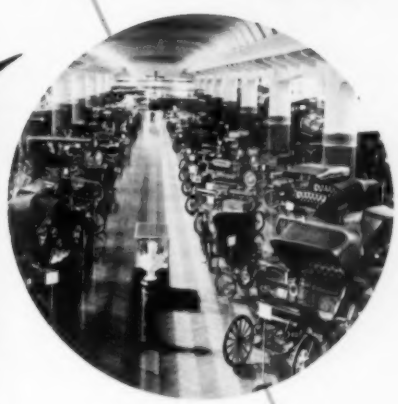
Bring the Ladies . . .

They will greatly enjoy the pleasures of sight seeing and shopping in Detroit.

Visiting the hundreds of outstanding churches, restaurants, theatres, night clubs, sporting events and cultural institutions will be an experience they'll long remember.



Don't Forget . . . Detroit—June 15-19—A.E.S. Convention and Exposition

INTERSOCIETY NEWS

BLOUNT NAMED MFSA TREASURER AND TRUSTEE

To succeed the late Thomas A. Trumbour, the Metal Finishing Suppliers' Association (MFSA) elected Ezra A. Blount to its office of treasurer at a meeting of the Association's Board of Trustees held at the Conrad Hilton Hotel, Chicago, Jan. 31 with President Earle W. Couch in the chair. Mr. Blount was also elected a trustee to serve the unexpired term of the late Mr. Trumbour.

Ezra Blount is editor of *Products Finishing*, a recent Past President of the AES's Cincinnati Branch and co-chairman of the AES's National Convention held in Cincinnati May 19–22, 1958.

INDUSTRIAL WASTE CONFERENCE SCHEDULED FOR MAY

The 14th Purdue Industrial Waste Conference will be held on May 5, 6 and 7 at Lafayette, Indiana in the Purdue Memorial Union Building and approximately fifty papers on recent developments in the treatment, analysis and control of industrial wastes will be presented. All who are interested are welcome to attend.

Hotel reservations may be made with the Purdue Union Club, Fowler Hotel, Cedar Crest Hotel, Morris Bryant Hotel, Devon Plaza Motel or Howard Johnson Motel, all located at Lafayette.

The conference program and registration blank will be mailed sometime in April. Of particular interest among the papers to be given are: "The Flue Gas Method of Treating Chrome Plating Waste," by J. W. Canan. "Effects of Industrial Wastes on Stream Life," by W. W. Towne and W. M. Ingram. "Effect of Chrome Plating Wastes on a Sewage Treatment Plant," by G. K. Erganian. "Rates and Charges for Sewer Service to Industry," by G. K. Erganian.

NEW NACE OFFICERS TO BE INSTALLED

Officers of the National Association of Corrosion Engineers elected to serve for the 1959–1960 term, will be installed at the association's 15th Annual Conference, Chicago, March 20. In addition to officers three men elected to the board of directors also will take office for three year terms.

Hugh P. Godard, Aluminium Laboratories, Ltd., Kingston, Ont. was elected president; George E. Best, Solvay Process Div., Allied Chemical Corp., vice-president; and A. L. Stegner, Tennessee Gas Transmission Co., treasurer.

Mr. Godard was elected to his new office while serving as vice-president of the association. He also has been active in the association in other capacities, having served on the board of directors, worked with technical committees and the corrosion abstract subcommittee.

Mr. Best is chairman of the NACE corporate membership committee; a member of the awards committee and is active on two technical committees. His past service includes: director, 1954–57; member, executive committee, 1955–57; member, technical program committee, for the 1952 NACE conference; vice chairman and chairman successively of the chemical inhibitors symposium for the 1956 and 1957 conferences. He is author of technical papers. A member of the AES, he is technical adviser to the general manager of technical service, Solvay Process Div., Allied Chemical Corp. Prior to the merging of Mutual Chemical Co. with Solvay, he was manager of technical service, Mutual Chemical Division.

WIDELY ANTICIPATED MEPA BANQUET MAY 16 AT NEW YORK'S FAMED PLAZA

The dynamic Masters' Electro-Plating Association, Inc. (MEPA), one of the nation's leading associations of "plating" concerns, will conduct its Forty-First Annual Banquet and Entertainment in the Grand Ballroom of New York's historic Plaza Hotel, Saturday, May 16, 1959. For some four decades an outstanding social event of this industry's social season, MEPA's Banquet is high rated in decor, menu, service and entertainment.

This year's MEPA Banquet will, as usual, be preceded by a lavish reception and cocktail party commencing at 6:30 p.m. Then will follow the banquet itself in the Plaza's renowned ballroom, one of Knickerbocker's noblest rooms. A traditional feature of the evening is the awarding of MEPA's "Plating Man-of-the Year." As usual, there will be top-grade entertainment followed by dancing to one of the Empire City's name orchestras. Dress is optional.

Tickets are priced at $25 per person and may be purchased through MEPA's Executive Office located at 59 East Fourth Street, New York 3, N. Y. Executive Secretary is A. T. Marinaro. You are most cordially invited by MEPA to attend.

METAL FINISHING SUPPLIERS' ASSOCIATION TRUSTEES MEETING, CHICAGO, JAN. 31

Left to right, H. D. McLeese, Metal and Thermit Corp., trustee; C. C. Helmle, Enthone Division, American Smelting and Refining Co., trustee; L. A. Davies, Davies Supply and Mfg. Co., trustee; R. M. Norton, Hanson-Van Winkle-Munning Co., trustee; A. P. Munning, Munning and Munning, Inc., executive secretary; E. W. Couch, Lea Manufacturing Co., president; Fred P. Green, Crown Rheostat and Supply Co., second vice president; R. F. Ledford, Chemray Corporation, first vice president; D. F. Mosher, Lea-Michigan, Inc., liaison representative for 1959 AES Golden Jubilee Convention; Ralph D. Wysong, Studebaker-Packard Corp., AES national first vice-president; Harold W. Baker, Electro-Galvanizing Co., NAMF liaison representative; John P. Nichols, AES national executive secretary; Herberth E. Head, Chrysler Corporation, AES national president.

WESTERN METAL CONGRESS OPENS MAR. 16

Western sections of 37 nationally known technical societies are participating with American Society for Metals in sponsoring the 11th Western Metal Congress and Exposition in Los Angeles March 16–20.

The educational display of metals, metal working, fabrication and application will be in Pan-Pacific Auditorium and connected pavilions.

On the same dates, the 11th Western Metal Congress will be presented in Los Angeles' Ambassador Hotel. Sessions will be held by American Society for Metals, American Welding Society, Society for Nondestructive Testing and Metals Branch—Southern California Section, American Institute of Mining, Metallurgical and Petroleum Engineers.

LORIG CITES METALLURGICAL ADVANCES

In a year-end report, Dr. Clarence H. Lorig, president of the American Society for Metals, and technical director of Battelle Memorial Institute in Columbus, Ohio, highlighted the generation of heat hotter than the sun, the perfection of two new steels, one with the highest tensile strength of any metal on record, and a new "explosive forming" technique for shaping metal.

These and other metals developments prompt Dr. Lorig to observe that "we are on the threshold of even greater achievements in meeting space age demands. The past year has seen huge strides by our metals experts who today are working with metals subjected to temperatures as low as —434F and as high as 5000F."

Two steels introduced in the past year offer greater strength, excellent formability and are readily welded. First of the two steels is an air cooling, ultra-high strength alloy for sheet forms with tensile strengths up to 280,000 pounds per square inch. The second steel, hardly out of the laboratory, has shown strengths to 400,000 psi, the highest level ever reached by metal. If production presents no serious problems, it will compete favorably with titanium alloys. It is reported also to have high ductility down to —385F.

Perfected this past year, "explosive forming" or "high energy rate" metal forming takes advantage of the little understood phenomenon in metals whereby a viscous state is created through great and rapidly applied pressures obtained from dynamite or TNT. Complicated shapes can be produced by this revolutionary method in a fraction of a second and in some cases without dies. A new machine developing extremely high pressures and releasing them instantly with a force comparable to a dynamite explosion is currently attracting attention. This compact new machine can turn out parts now requiring very large presses.

ASME DESIGN ENGINEERING CONFERENCE SET FOR PHILADELPHIA

Consideration of more effective use of engineers by companies which employ them will highlight the topics to be discussed at the fourth Design Engineering Conference, sponsored by the machine design division of the American Society of Mechanical Engineers, in Philadelphia, in May.

The conference is held concurrently with the Design Engineering Show. Both events are scheduled for Convention Hall, Philadelphia, May 25 to 28, inclusive. Conference sessions will take place in the mornings and the show during afternoons.

The show, which features exhibits to help companies in the designing of new end products, will have on demonstration mechanical components, power transmission equipment, electrical and electronic components, metals, nonmetallic materials, fasteners and adhesives, finishes and coatings, shapes and forms, hydraulic and pneumatic components, and various engineering equipment and services.

ASEE-ASTM EDUCATION IN MATERIALS SYMPOSIUM

The American Society for Engineering Education and the American Society for Testing Materials, will sponsor jointly a symposium on Education in Materials at the ASTM Annual Meeting in Atlantic City, June 22–26, 1959.

Tentatively scheduled for Monday as the feature of the first day of the Annual Meeting, the symposium will include an introductory paper by Professor Kenneth B. Woods, ASTM president, head of the School of Civil Engineering at Purdue University. The ASTM viewpoint on the subject will be presented by Frank L. LaQue, ASTM senior vice president and vice president and manager of the Development and Research Division, The International Nickel Company, Inc. The educators' viewpoint will be given by Dean William T. Alexander of Northeastern University, president of ASEE. Requirements in materials education from the viewpoint of industry will be discussed by two speakers representing the nation's leading industries.

CORROSION INHIBITORS SYMPOSIUM

Research in the field of corrosion inhibitors will be discussed at a meeting to be held in Chicago on May 7 under sponsorship of Armour Research Foundation of Illinois Institute of Technology and the Chicago section of the Electrochemical Society.

The meeting—titled Symposium on Corrosion Inhibitors—will be devoted to consideration of basic studies concerned with the theory and mechanism of inhibitory processes, according to Jacob Miller, associate electrochemist, metals research department, Armour Research Foundation.

Mr. Miller and Ernest L. Koehler, director, electrochemical metallurgy laboratory, Continental Can Co., are the symposium chairmen.

Inquiries concerning the meeting should be sent to M. J. Jans, Armour Research Foundation, 10 W. 35th St., Chicago 16, Ill.

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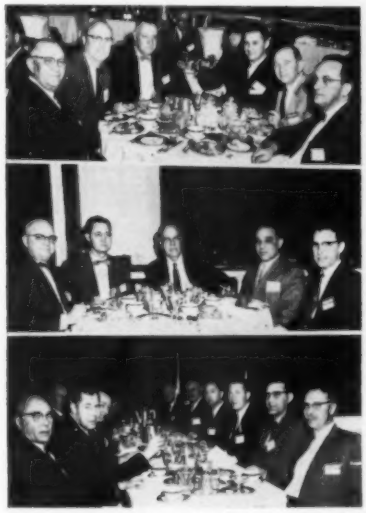
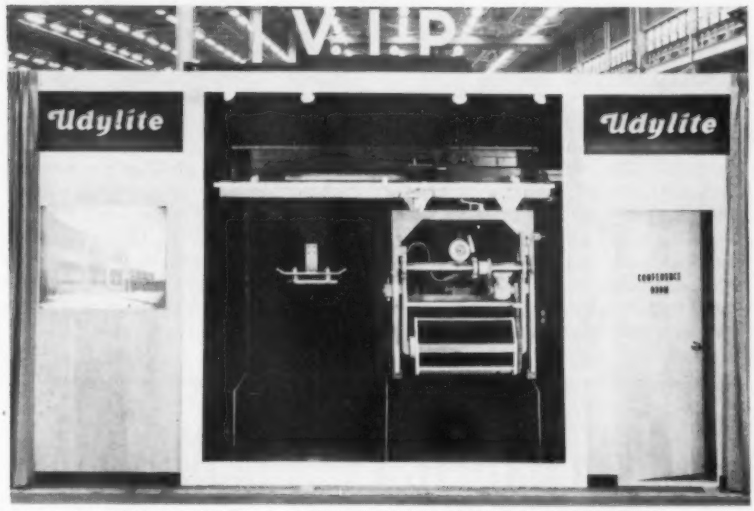
INDUSTRY NEWS





PREVIEW OF NEW UDYLITE V.I.P. AUTOMATIC PLATING MACHINE AT CHICAGO LUNCHEON

(LEFT) Three of the tables at the Udylite Corp. luncheon to about 300 members of the electroplating industry in the Boulevard Room of the Conrad Hilton Hotel, Chicago on Saturday, January 31, to preview their new V. I. P. automatic plating machine (RIGHT). The V.I.P. was ingeniously introduced. In a darkened room, curtains opened only on the lighted doorway, a bugle blast preceded a taped conversation which led to the lighting of the machine in operation. The conversation continued to point out the salient features of the V.I.P. until the full lights came on and close inspection was made possible.

MACARR TAKES OVER WALKER DIVISION OF NORMA HOFFMAN

Macarr, Inc. has absorbed all Walker Division of Norma Hoffman inventory, engineering data and customer files.

The transaction was initiated in order to maintain continuity of maintenance, service and replacement parts for all Walker Division equipment now in the field, according to Macarr.

SUPPLEMENTARY LIST OF EXHIBITORS 1959 INDUSTRIAL FINISHING EXPOSITION

(SINCE LIST PUBLISHED IN FEBRUARY 1959 ISSUE)

American Optical Company (Instrument Division)
Belke Manufacturing Company
Bias Buff & Wheel Company
Diversey Corporation
Electro-Glo Company
General American Transportation Company
Allied Chemical Corporation (General Chemical Division)
Industrial Plastic Fabricators, Inc.
Ionic Electrostatic Corporation
Merit Products, Inc.
Metal Finishing Magazine
N.R.C. Equipment Corporation
Geo. L. Nankervis Company
National Carbon Co. (Division, Union Carbide Corp.)
New Holland Machine Company
Plating Magazine
Products Finishing Magazine
Research Program, American Electroplaters' Society
Sethco Mfg. Corp.

(AS OF FEBRUARY 6, 1959)

ROTO-FINISH BUYS RANSOHOFF

Gunther W. Balz, president of the Roto-Finish Co. of Kalamazoo, Michigan, has announced the purchase of Ransohoff, Inc., Hamilton, Ohio.

Mr. Balz stated that no material changes were contemplated in the personnel or the operations now being conducted at the Hamilton, Ohio plant of Ransohoff. R. E. Wigger, vice president of Ransohoff, Inc., will be in charge of the Ransohoff operations as executive vice president of the new Ransohoff Company.

Mr. Balz, president of the combined companies, stated the acquisition of Ransohoff by his firm will provide engineering and manufacturing facilities for a complete line of metal treating machinery.

DU PONT OPENS NEW RESEARCH CENTER

A new, modern research center for Du Pont's electrochemicals department was formally opened at Niagara Falls, N. Y. on Jan. 16.

A tour of the two-story building by civic and industrial leaders marked the opening of the laboratory, which is located adjacent to Du Pont's manufacturing plant on Buffalo Avenue.

Dr. Campbell Robertson, laboratory manager, said the new building will be the focal point for research and development work on products and processes vital to the department's established business in sodium, vinyl products, peroxygen compounds, nylon intermediates and related fields. In addition, laboratory personnel will pursue research leading to the development of new products.

The building itself has a floor area of 44,000 sq ft and is occupied by about 100 persons. The building contains 15 laboratories, three laboratories with special analytical equipment, a constant temperature room, lunch room, library, conference room and offices.

Construction is of brick and steel frame, with light green trim of vitreous enameled aluminum. The process for enameling aluminum is a development of the electrochemicals department research program.

ENTHONE EXCLUSIVE DISTRIBUTOR FOR ABBEY PROCESS

Abbey Process Automation, Inc. of Long Island City, New York has appointed Enthone, Inc. of New Haven, Connecticut, subsidiary of American Smelting and Refining Co., as exclusive distributor for its automation system. The agreement covers that portion of the United States east of the Rocky Mountains. Enthone is also authorized to sell Abbey equipment on a non-exclusive basis in the remainder of the United States and in Canada.

In announcing the arrangement, Harold G. Abbey, president of Abbey Process

Automation cited Enthone's experience in the metal finishing equipment field and their manufacturing facilities. These facilities, coupled with Enthone's large technical and engineering staff trained in developing plating and finishing cycles, made them a logical choice to market the new Abbey automatic conveyor system, he stated.

The Abbey conveyors will be built at the Abbey plant while tanks and accessory equipment will be manufactured at Enthone.

The Abbey automation system is built around several new patented devices which give fully automatic equipment the flexibility of hand operation. Vertical movements of work carriers in and out of processing tanks do not have to be synchronized with horizontal or "transfer" movements from one tank to the next. Work carriers have the ability to "leapfrog" over other carriers which are in the lowered position thereby eliminating the necessity of having all carriers move in a fixed sequence. Each elevator station is an independent unit.

WHITEHEAD CHANGES NAME

At a recent meeting of the board of directors of Whitehead Metal Products Company, Inc., a resolution was passed changing the company name to Whitehead Metals, Inc.

The streamlining of the name simplifies communications and clarifies a misleading inference suggested by the word "Products." Whitehead Metals, Inc., distributes nickel, copper, aluminum and stainless alloys, but does not fabricate metals as the original name might imply.

Whitehead Metals, Inc., maintains offices and warehouses in New York City, Baltimore, Buffalo, Cambridge, Mass.; Harrison, N. J.; Philadelphia, Rochester, Syracuse and Windsor, Conn.

TECHNICAL PROCEEDINGS AWAITING YOUR ORDER

CONTAINING each of the technical papers delivered before the AES's 45th Annual Convention held in Cincinnati, Ohio, May 19-22, 1958, together with their charts, diagrams, graphs, tables and other illustrations, and with the verbatim discussion that followed their delivery, TECHNICAL PROCEEDINGS (1958 Edition) broadly enriches technical and scientific knowledge in the field of electroplating, metal finishing and allied arts.

It also includes the stenotype report of the panel session on "Practical Plating Problems" that was a hit of that Convention.

A larger book than the 1957 edition, it also carries a front section that includes a complete chronological list of AES Conventions and Past Presidents; a day-to-day log of the 45th Annual Convention; a section on the AES Scientific Achievement Award and on the Paper Awards presented at that convention; a full listing of AES's 1958-1959 Boards and Standing and Special Committees and a complete Branch Directory up to date as at September 1, 1958.

The domestic price of the 1958 Edition of TECHNICAL PROCEEDINGS is $12 per copy including postage. To those ordering from outside of the United States' continental limits, the charge is $15 per copy including postage. All orders must be accompanied by payment in full. Address orders and make checks payable to:

AMERICAN ELECTROPLATERS' SOCIETY

445 BROAD STREET • NEWARK 2, N. J.

A limited quantity also exists of the 1956 book at $12.50 per copy domestic; $15 per copy foreign and of the 1957 book at $10 per copy domestic and $12.50 per copy foreign. All orders must be accompanied by payment in full.

FREDERICK GUMM TO REPRESENT CROWN RHEOSTAT

Crown Rheostat & Supply Co. has appointed Frederick Gumm Chemical Co. as a distributor for the general line of Crown fully automatic plating equipment, and also Crown's line of tumbling equipment and miscellaneous items.

This arrangement became effective Feb. 1 and covers the New England states, as well as the states of New York, Pennsylvania, New Jersey, Delaware and Maryland.

Howard Martin, the general sales manager of Gumm Chemical, will direct the sales organization from the home office in Kearny, New Jersey. Resident representatives of Gumm will staff each of the several district areas.

Ed Jevely at Boston covers the state of Massachusetts. J. M. Barry and J. C. Barry, living in New Haven, will cover the state of Connecticut. Al Fusco and Sid Boyer have the territory of Metropolitan New York, and Louis Marino the state of New Jersey. Vincent Caswell from Philadelphia is to cover the state of Pennsylvania.

Charles Clark, residing in Rochester, will cover Western New York State, and Foster Applegate, from Syracuse, has the East Central area of New York State.

This distributorship arrangement expands the services of both Gumm and Crown Rheostat & Supply throughout the electroplating industry in the Northeastern area of the country.

DIVERSEY BUYS BRITISH CORPORATION

The Diversey Corp. of Chicago, manufacturer of chemical products and detergents for industrial use, acquired their fifth new company within a year in its world-wide expansion program with the purchase of Deosan Limited in London, England.

Diversey purchased the English company for approximately $800,000 from Vick International Limited (a unit of the Vick Chemical Co.). The stock of Deosan Limited will be owned by Diversey Corp. (United Kingdom) limited, a wholly owned subsidiary of the Diversey Corp. of the United States now celebrating its 35th year of operation. Other overseas companies of the Diversey Corporation are located in Paris, France; London, England; Sao Paulo, Brazil; Sydney, Australia; Caracas, Venezuela; Hato Rey, Porto Rico; Honolulu, Hawaii and Italy.

The company also owns plants in South Gate, California; Macon, Georgia; Newark, New Jersey; Montreal and Toronto, Canada.

DUNNING BUYS MADISON PLATING

Madison Plating Co., industrial electroplating firm, 1003 Pusheck rd., Bellwood,

Ill., has been purchased by David W. Dunning, Chicago area sales engineer for the past 13 years.

Operations of the multi-purpose electroplater will continue unchanged, he said.

For nine years Dunning was in charge of sales for the Meaker Co. of Chicago.

Mr. Dunning is a graduate from Stanford University.

INFILCO ACQUIRES GALE SEPARATOR

Infilco Incorporated has announced the acquisition of the Gale Separator Co. of Bloomfield, New Jersey.

This company was organized 25 years ago by William A. Gehle, who maintained a full time interest in it until his death last June. Shannon Gustafson, president of Infilco, has expressed satisfaction in this latest expansion of the company. The activities of the Gale Company will be continued and merged with Infilco operations.

NEW LABORATORY FOR ATLAS

Atlas Powder Co. is building a new laboratory for expanded research on activated carbons at the site of its present Darco Experimental Laboratory near Marshall, Texas.

The new facilities will have nearly 13,000 square feet of floor space. This is about three times the space available in the present units, which will be remodeled to increase product control laboratory facilities for the Marshall plant.

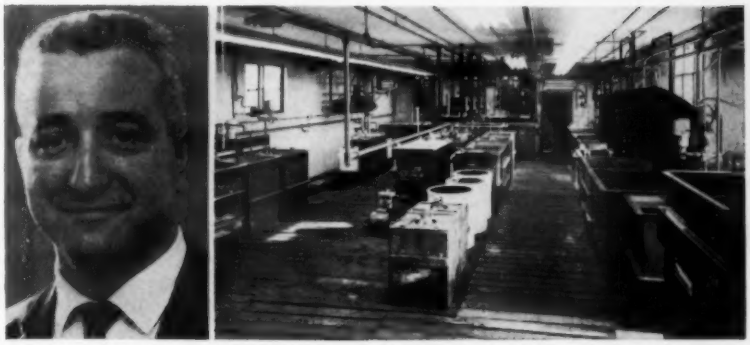
Approximately 40 persons—including 12 professional personnel—will be employed in the new lab when it is completed. Work at the new lab, which is a part of the company's chemical engineering department, will be devoted principally to the continued development and improvement of present grades of activated carbons and to the development of new types for a number of applications.

TURCO BUILDS NEW HEADQUARTERS

Turco Products, Inc. has broken ground in Wilmington, California, 20 miles south of Los Angeles, on a 66,000 square foot, million dollar national headquarters. The new facility, scheduled for completion next summer, consists of an administration building and executive wing, a research center and an engineering service building. It will be contiguous to Turco's modern "push-button" manufacturing plant, which was built on the site some three years ago.

The new Administration Building will feature curtain wall construction, modern fluorescent lighting with demountable partitions, and is air conditioned throughout.

The Research Center will be the most modern facility of its kind, completely air conditioned and equipped to provide facilities for development of new products and processes and assist in the analysis of customer applications.



(LEFT) Fred R. Davino, president and founder of the newly formed company, Plating for Electronics, Inc., Waltham, Mass. (RIGHT) Interior view of metal plating facilities of Plating for Electronics, showing the degreaser, filters, rectifiers, thermostats, heaters, spray rinse tanks; exhaust hoods and blower, bifurcator, and other equipment supplied by the M. E. Baker Co.

PLATING MAGAZINE

AMERICAN ELECTROPLATERS' SOCIETY

Opportunity to Authors

Member or non-member authors of technical and scientific papers on electroplating, metal finishing and related arts are cordially invited to submit manuscripts of original, unpublished papers to the Editor of PLATING for review and publishing consideration.

Any such paper accepted and published in PLATING will also be eligible, of course, for selection by the Society's Paper Awards Committee for the Carl E. Heussner Award; AES Silver Medal; AES Bronze Medal; George B. Hogaboom Memorial Award; Robert S. Leather Mechanical Finishing Award; Chromium Plating Award; Precious Metal Plating Award, or the John J. Hanney Memorial Award.

So as to expedite review and other processing, please write the Editor, PLATING, 445 Broad Street, Newark 2, New Jersey, for full particulars before submitting your manuscript.

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How many times have you had to dissolve sodium cyanide and then carefully stir in copper cyanide to make an addition to your copper tank? There's an easier way now. True Brite has available concentrated solutions of copper and sodium or potassium cyanides. Also the dry salts are available where freight or volume of solution are problems. All this is available at prices you can afford. A bulletin with specifications and prices is available on request.

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INDUSTRY NEWS BRIEFS

ROCKFORD BRANCH ANNUAL TO BE HELD IN TRUE GOLDEN JUBILEE ATMOSPHERE

The Rockford Branch, AES, will hold its 17th annual educational meeting and banquet on Saturday, Mar. 7, at the Faust Hotel in Rockford, Ill.

At 10:00 a.m. a Workshop on Metal Finishing Problems will be headed by a panel consisting of Clyde Kelly, Rudy Hazucha and Don Morris of the Chicago Branch and Walt Fox, Bob Burnap and Paul Repka of Rockford. Luncheon is scheduled for 12:30.

The technical session will start at 1:30 p.m. with Walter L. Pinner, McGean Chemical Co., discussing "Results of AES Research Project No. 15." Dr. Edward B. Saubestre, Enthone, Inc., will present a paper on "Cleaning Evaluation Studies." "New Developments in Electro-Static Finishing" is the subject chosen by Dr. Emory P. Miller, Ransburg Electro-Coating Corp.

At seven in the evening the ladies will join the men for the banquet, floor show and dancing.

NEW LINE TO BLACKEN SPARK PLUGS

A new automatic conversion coating machine for blackening spark plug shells has been installed in a production line at AC Spark Plug Division of General Motors.

Heart of the process is Convert-O-Matic, a new, straight-line conveyor developed and built by Hanson-Van Winkle-Munning Co., Matawan, N. J. This machine permits maximum cycling flexibility by settings of selective timers provided for each treatment tank. It is equipped with a rotating processing barrel that opens and closes automatically to receive and discharge the work. The operation is completely mechanical once it is set up and running.

AC Spark Plug integrated the new machine into its production line by installing equipment to feed the work to the barrel and remove it after treatment for mechanical transfer to the next processing unit on the line.

GRANT FOR STUDY OF DUCTILE FRACTURE OF METALS

A study of the ductile fracture of metals will be made at the Illinois Institute of Technology under a grant of $36,500 from the Air Force Office of Scientific Research.

Directed by Dr. N. H. Polakowski, professor in the metallurgical engineering department, the program will probe the rather obscure laws governing the failure of metal when it is drawn out or hammered thin.

NEW MINNEAPOLIS ADDRESS FOR WYANDOTTE

The Minneapolis Office of Wyandotte Chemicals Corp. has moved to 1104 Currie Avenue, Minneapolis 3, Minnesota.

ARMOUR ALLIANCE INDUSTRIES FORMED

Formation of the Armour Alliance Industries by combining the coated abrasives, cushioning products and adhesives operations of Armour and Company, has been announced by F. B. Patton, vice president.

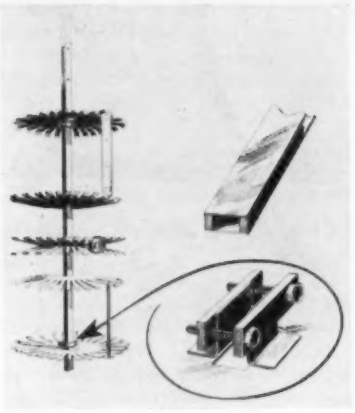
Carl B. Johnson is general manager, succeeding R. L. Reeves, resigned. Mr. Reeves formerly headed the Alliance Divisions which were composed of the cushioning products and coated abrasives units. Headquarters of the new organization will be at Alliance, Ohio.

Mr. Johnson was formerly production manager of the Soap Division in Chicago. He joined Armour in 1949 as general superintendent of the Armour Auxiliaries.

R. W. Gutheil, formerly general manager of the Adhesives Division, is marketing director, a newly created position. He has been with Armour since 1954.

EQUIPMENT AND SUPPLIES

Use the convenient Reader Service Card to obtain additional information on any of these items



E—301. Adjustable Racking System—All-titanium racks that can be instantly revised to accommodate wide variations in sizes or shapes of parts are now available from Service Screw Products Co. The degree of adjustment is continuous from one one-thousandth of an inch to 32 in.

The rapid changeovers are accomplished by means of a newly perfected rigid titanium spline plus disc-type titanium workholders fitted with integral clamps. The workholders can be quickly and positively positioned at any desired location on the spline. A virtually unlimited variety of parts can be racked on the available disc types.

Complete titanium construction requires no coating, assures long rack life and eliminates the stripping requirement. Constant contact and tension are maintained throughout each part run resulting in uniform anodic film thicknesses and good color match.

E—302. Deburring and Finishing Machine—The Mecha-Finish Corp. announce another Mechamatic Unit, No. MM-4-8, designed for a multiplicity of parts. It has the specific advantage of handling paired components which must be deburred and remain together, such as connecting rods and caps.

The parts are mounted on spindle fixtures, air operated, which are submerged, while rotating, in a fluid abrasive mass which simulates a form fitting grinding wheel, regardless of the shape of the piece and travels at the rate of 300 to 600 sfm.

The process is completely automatic and controlled except for loading and unloading the parts, for which no special skill is required.

E—303. Anodic Coating—A clear anodic coating for magnesium alloys that can be applied in less than a minute has been developed by The Dow Chemical Co.

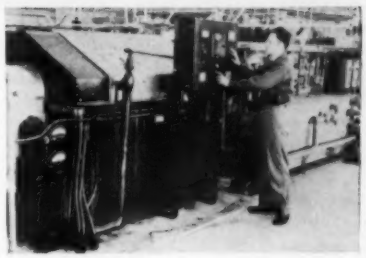
The new anodize is used under a lacquer or varnish for maximum corrosion protection. Up to now, manufacturers desiring a "metallic look" for magnesium products have used lacquer or varnish over the bare metal. The clear anodize plus one of the top coats provides better protection than the top coat alone, according to Dow.

Lacquer or varnish tinted with commercial dyestuffs can be applied over the clear anodize to obtain a transparent effect in a wide variety of colors.

The clear anodize for magnesium is a modification of the standard Dow 17 anodic treatment. The latter results in yellow or green opaque deposits. Clear anodize uses a 40-v current compared to 70–90 v for the standard Dow 17. The anodizing baths are identical.

E—304. Chromium Plating Barrel—A completely automatic continuous chromium plating barrel which is said to offer great economy and high quality plating has been announced by Metal & Thermit.

It has an hourly output equal to three and a half to four batch barrels and needs attention only for feeding parts into it and the removal of the plated parts from a tote box.



The barrel is designed so that dry and burnished parts are introduced into one end of the machine and are fed automatically into the plating barrel which has specially designed baffles to assure plating without contact marks.

Timing is automatic and can be adjusted for thickness of plate desired and number of parts being plated at any time.

Capacity of the barrel will vary depending on the size of the parts being plated.

E—305. Gold Process—Lea-Ronal Inc. has announced the release of their new Auro Glo Gold plating process. This gold plating process has shown superior characteristics over the conventional cyanide and bright cyanide gold deposits,

MANUAL AVAILABLE TO BRANCHES

As a reference source to help Branches and Branch officers in effective Branch operation, many dedicated National and Branch leaders collaborated, without any remuneration, in preparing the comprehensive BRANCH OFFICERS MANUAL of the American Electroplaters' Society, embodying practically every conceivable Branch operating subject from membership promotion to Delegates' duties.

Within red covers bound by Chicago screws, this 225-page consolidated mimeographed looseleaf book is now in use in 36 AES Branches that ordered copies.

A limited extra quantity of the book is still available at National Headquarters for the accommodation of Branches that have not previously ordered copies. These will be sold to Branches (only), on a first-come, first-served basis so long as that supply lasts, at $5.50 per copy, including postage to one destination.

Write American Electroplaters' Society, Inc., American Building, 445 Broad Street, Newark 2, N. J. Payment should accompany order to obviate unnecessary bookkeeping expense.

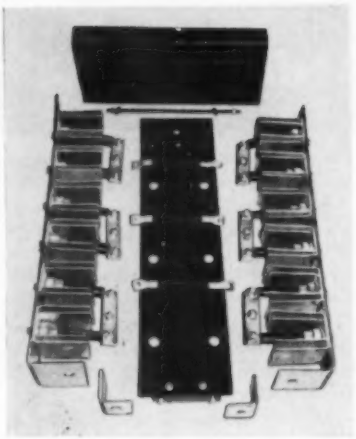
particularly in the electronics and decorative industries according to the company.

Deposits show hardness and wear resistance that are from 5 to 10 times as hard as gold deposits from a conventional cyanide bath and 2 to 3 times as hard as deposits secured from bright cyanide gold solution, it is claimed. For the decorative industry this process offers the ability to secure numerous alloy colors ranging from rich yellow golds to the "Hamilton" shades so popular in the industry.

E—306. Conversion Kit—A silicon conversion kit for modernizing magnesium-copper sulfide and selenium rectifiers has been announced by Dresser Electric Co.

The kit will give up to 50 per cent higher efficiency than magnesium-copper sulfide rectifiers according to the manufacturer.

Silicon is said to have no aging characteristic and can be stored for extended periods of time without any adverse effects on the cells. Each cell is hermetically sealed to guard against moisture and plating-room atmospheres.



E—307. Grinding Wheel Dresser—Thompson Sales Co. announces the availability of their No. 514 grinding wheel dresser for keeping grinding wheels sharp and true, also for sharpening loaded discs and belts that are not completely worn out.

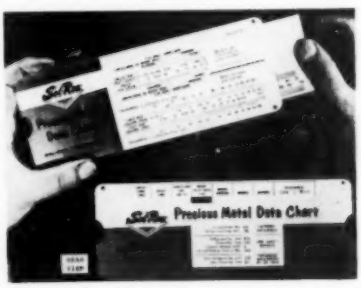
A light touch is all that is necessary to get results.

This modern grinding wheel dresser runs on a resilient bushing and will shape and sharpen wheels and discs from 0.25 to 20 in. in diameter. Worn cutters can be replaced instantly as they are a combined unit, no loose blades.

E—308. Drawing Compound—The Schaffner Mfg. Co., Inc. announces the development and production of a new aluminum drawing compound, DC-327, under the trade name of Luma-Draw.

It will prevent sticking or binding of blanks in the draw dies, protect applied finish before forming, prevent galling of steel dies, and protect hard rubber dies against abrasion according to the company.

E—309. Cost Slide Chart—The cost of precious metals plating per unit area to specified thicknesses, may be seen at a glance with the new Sel-Rex precious metals data chart. By setting the device to the price paid per troy ounce or gram, you read the cost of plating gold, platinum, rhodium, silver and various proprietary precious metals formulations.



The slide chart also tells cathode efficiency date; milligrams per square inch and grams per square foot of particular precious metals for .0001 in. deposits; recommended current densities and actual plating time required for nine different precious metals plating formulations; and corresponding thicknesses, in millionths of an inch, of one milligram per square inch, and one gram per square foot, of the various precious metals.

ionXchange

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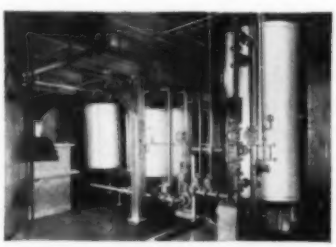
Here is how to solve some waste disposal problems -and reduce costs at the same time

IonXchangers of several types, and various units of allied equipment, as designed and manufactured by Illinois Water Treatment Company, offer a number of money-saving opportunities. *For example, consider the waste water from rinse tanks.* Contaminants can be removed and concentrated, and *pure* water returned to the rinse system. In some instances, chrome and other valuable metals can be recovered from the rinse water. *For another example, consider plating solutions* which, under many circumstances, become polluted and less efficient. The contaminating materials can be removed, recovered if valuable, and the bath maintained at high purity. Also, impurities found in water supplies, to spoil the appearance of plated or anodized parts, can be removed so that uniform quality of work is assured. Spent metal finishing solutions such as aluminum bright dip can be purified for re-use. Toxicity in otherwise-clean waste can be eliminated. All of these treatments will, in one way or another, contribute substantially to improved products, more efficient operations, and lowered costs. *Specific possibilities of applications of ionXchange in your plant can be determined by talking to your ILLCO-WAY representative.*



IonXchanger recovery unit for plating solutions

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CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

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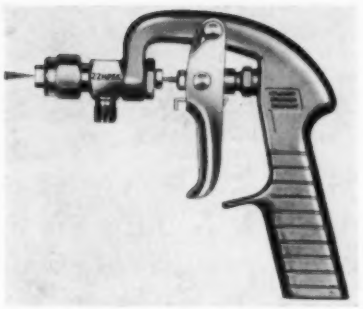


E—310. Airless Sprayer—Spraying Systems Co. has introduced its new 22 HPSSTC GunJet heavy duty spray gun for use in hydraulic spray coating and painting at pressures up to 2,000 psi. This new gun operates without the use of air, requiring only higher pressures as obtained in airless paint spraying systems.

Orifice tips are interchangeable and are available in an unusually wide choice of capacities, spray angles and materials to meet every known requirement. Choice of tip materials include stainless steel, hardened stainless steel, chrome plated brass and tungsten carbide inserts in chrome plated tip body. The valve seat and mating needle insert are made of tungsten carbide for maximum resistance to abrasion. The stainless steel body and teflon packings provide maximum resistance to chemical action.

E—311. Tank Liner—Availability of laminated fibre glass tank liners for the plating and metal-finishing industry has been announced by the Myco Company, Inc.

Liners are built to specification of laminated seamless fibre glass and plastic resin formed and set under pressure and heat. They are fitted to wooden tank, constructed of plywood, reinforced with structural wood members. Liner extends over the edge and includes a 12 in. skirting.

Tanks and liners are available in most sizes and shapes and are reported to have high corrosion resistance to acids and caustics and high resiliency to impact.

E—312. Liquid Cleaner—Heatbath Corp. introduces a new liquid product, known as No Bleed, for removing entrapped or absorbed blackening salts from powdered metal parts. It is claimed to insure against conditions referred to as bleeding, blooming, flowering and weeping out that become visible and are objectionable on blackened powdered metal parts.

The liquid is used as received at a temperature of 240–250F for 15–30 min. The powdered metal parts are then allowed to dry and are eventually re-oiled.

E—313. Wide-Belt Grinder—Designed to offer a greatly increased range of workpiece capacities, a new series of Engelberg conveyor-type models will belt-grind flat stock to extremely fine, micro-inch finishes, at continuous through-feed rates of from 10 to 60 ft/min. The single-head model shown, with 25 hp totally enclosed fan-cooled belt-drive motor, will accommodate sheet stock up to 22-in wide, any length. Other wide-belt models are available in various belt widths, with single or multiple grinding heads.

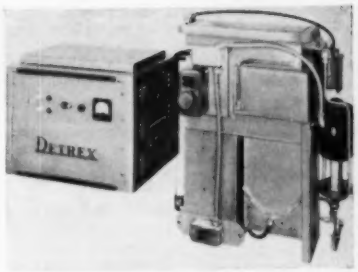
E—314. Barrel Finishing Media—Three major barrel finishing problems—discoloration, impingement and media fracture—have been virtually eliminated with a new shaped media introduced by Minnesota Mining and Manufacturing Co., it is reported.

The Honite brand C-R tumbling shape is a truncated triangular pyramid with sharp edges and acute angles that work into radii not reached by other types of media.

The cutting speed of the new shape, composed of aluminum oxide mineral anchored in a 3M-developed binder is up to two and one-half times faster than existing aluminum oxide chips, and as much as 12 times faster than natural stone media, the 3M company claims. Because of its speed and concentrated cutting action, the media is specifically intended for stock removal.

The new shape is also claimed to offer a significant reduction in contamination of workpiece surfaces by metallic and mineral residue.

E—315. Ultrasonic Unit—Detrex Chemical Industries, Inc., announces the introduction of a new model Econo-Sonic unit that is a complete cleaning, distillation and filtration system in itself. This ultrasonic unit pre-cleans, ultrasonic cleans and pressure-spray-rinses. It is ideally



suited for the use of manufacturers of small precision parts.

It is compact in design, measuring only 38½ in. wide, 17½ in. deep and 28¼ in. high.

E—316. Abrasive Wheel—American Buff Co. has developed Uniflex, an abrasive polishing wheel which automates operations, eliminating the need for hand operators and extra polishing operations.

Constructed of flexible, folded layers of abrasive-coated fabric, the individual units of this wheel follow every contour of complex metal forms. Set up ahead of other buffs on the automatic, these buffing heads permit uninterrupted finishing from rough part to completed product. A single automatic now grinds, polishes, sisals and color buffs at huge savings, according to the manufacturer.

E—317. Cleaner, Phosphatizer—Cowles Chemical Co. has introduced a new phosphatizing chemical Ty-Bond R-1, which cleans the surface of metal and produces an amorphous iron phosphate coating on ferrous metals, zinc and cadmium.

Coating weights up to 60 m/sq ft can be produced, providing an adequate base for paint adhesion and maximum corrosion protection it is claimed.

MILWAUKEE BRANCH ANNUAL TO CELEBRATE AES GOLDEN JUBILEE

The annual educational session and banquet of the Milwaukee Branch will be held on Saturday, April 25 at the Hotel Schroeder, Milwaukee, Wisconsin.

The educational session is to begin at 1:30 p.m. Three prominent speakers are on the afternoon program. Dr. W. Andrew Wesley, manager, Research Laboratory, International Nickel Co. and AES national second vice president, has selected as his presentation, "Weathering Behavior of Nickel, Chrome, Nickel-Chrome Coatings." "The Role of Agitation in Electroplating," is the title of the paper by Dr. Richard B. Saltonstall, technical director, The Udylite Corp., and Alex Andreoni, technical director, The Glidden Co., will speak on "Emulsion Coatings for Industrial Application."

ARTICLE REFERENCES

By
WILLIAM TUCKER
Eastman Kodak
Rochester, N.Y.

Most of the articles listed here may be obtained by writing to the publications in which the articles were published. Addresses are given at the end of the references for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

27. ALLOY

a. *SOME PROPERTIES AND APPLICATIONS OF CHEMICALLY REDUCED NICKEL.*
A. McL. Aitken.
Electroplating and Metal Finishing, *11*, No. 12, December 1958, pp. 427–431.

28. ALUMINUM

a. *FOUR STEPS TO SUCCESSFUL ANODIZING.*
J. B. Kerr.
Products Finishing, January 1959, pp. 38–46.

b. *ARCHITECTURAL ANODIZING.*
Light Metals, *21*, Oct. 28, pp. 328–329.
"Recommendations for finishes of satisfactory appearance and long life are based on research into anodizing procedures, on weathering over prolonged periods in different environments and on the recently issued specifications for anodic films. Aluminum alloys used, texture, anodizing conditions, coloring and sealing."

29. ANALYTICAL

a. *A NEW APPROACH TO THE ANALYSIS OF BRASS, CADMIUM AND ZINC PLATING SOLUTIONS USING ETHYLENEDIAMINE TETRA-ACETIC ACID AND FAST SULPHON BLACK F.*
K. E. Langford.
Electroplating and Metal Finishing, *11*, No. 12, December 1958, pp. 439–441.

30. CHROMIUM

a. *ELECTRODEPOSITION OF HIGH-PURITY CHROMIUM.*
F. E. Block, P. C. Good and G. Asai.
Journal of the Electrochemical Society, *106*, No. 1, January 1959, pp. 43–47.

31. CLEANING

a. *SONICS CLEANS DELICATE PARTS.*
The Iron Age, *183*, No. 2, January 8, 1959, pp. 64–65.

32. CORROSION

a. *DETERMINING CORROSION AGGRESSIVENESS OF THE ATMOSPHERE.*
N. D. Tomashov, G. K. Berukshits and A. A. Lokotilov.
Corrosion Technology, 5, No. 12, December 1958, pp. 386–388.

b. *THE FLADE POTENTIAL OF IRON PASSIVATED BY VARIOUS INORGANIC CORROSION INHIBITORS.*
Herbert H. Uhlig and Peter F. King.
Journal of the Electrochemical Society, *106*, No. 1, January 1959, pp. 1–7.

c. *SOME OBSERVATIONS ON THE MECHANISM OF INHIBITION.*
A. C. Makrides.
Journal of the Electrochemical Society, *106*, No. 1, January 1959, pp. 7–9.

33. ELECTROPLATING

a. *CHROMIUM-NICKEL PLATE GUARDS MOLYBDENUM.*
The Iron Age, *183*, No. 2, January 8, 1959, pp. 62–63.

34. ENGINEERING

a. *AUTOMATION APPLIED TO BARREL CADMIUM PLATING.*
William J. Rein.
Electroplating and Metal Finishing, *11*, No. 12, December 1958, pp. 442–446.

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35. GOLD

a. *HARD GOLD PLATING.*
A. G. Atanasyants, N. T. Kudryavtsev and V. M. Karataev.
Journal of Applied Chemistry of the USSR, *30*, 1957, pp. 926–930. (Translation by Consultants Bureau, Inc.).

36. MECHANICAL

a. *CONTROLLED VIBRATIONS SPEED AND SIMPLIFY PARTS FINISHING.*
W. E. Brandt.
The Iron Age, *183*, No. 3, January 15, 1959, pp. 79–80.

37. MISCELLANEOUS

a. *KNOW WHAT YOU'RE DOING WHEN YOU SET UP FOR CHEMICAL MILLING.*
Ken Clarke.
American Machinist, *103*, No. 1, January 12, 1959, pp. 114–117.

b. *RELIABLE PROPERTIES CAN BE GUARANTEED.*
R. S. Jackson.
Plastics Technology, September 1958, pp. 831–838.

c. *FAULT-FINDING IN THE PLATING DEPARTMENT.*
P. Green.
Electroplating and Metal Finishing, *11*, No. 12, December 1958, pp. 432–435.

38. NICKEL

a. *THE STRUCTURE OF ELECTRODEPOSITED NICKEL.*
B. C. Banerjee and A. Goswami.
Journal of the Electrochemical Society, *106*, No. 1, January 1959, pp. 20–23.

b. *HARD NICKEL PLATING IN RUSSIA—SULFATE-OXALATE BATH.*
A. J. Steiger.
Metal Finishing, *57*, No. 1, January 1959, pp. 52–53.

c. *EFFECTS OF IMPURITIES IN A BRIGHT NICKEL BATH ON THE COVERING POWER OF A CHROMIUM BATH.*
Robert H. Rousselot and Georges E. Rousselot.
Metal Finishing, *57*, No. 1, January 1959, pp. 58–60.

39. ORGANICS

a. *SCIENCE FOR THE COATINGS TECHNOLOGIST. PART XII. PAINT ADDITIVES—MILDEWCIDES.*
E. S. Beck.
Metal Finishing, *57*, No. 1, January 1959, pp. 54–57.

40. RHODIUM

a. *TESTING OF RHODIUM BATHS BY THE HULL METHOD.*
S. Dorner and L. Froeis.
Metallwaren-Industrie und Galvanotechnik, *49*, July 1958, pp. 299–305 (German).

The following are Metallurgical Abstracts taken from The Journal of the Institute of Metals.

September 1958 issue, p. 74, 78, 81 and 83.

CORROSION OF ALUMINUM BY ALKALINE SEQUESTERING SOLUTIONS.
H. W. McCune
(Indust. and Eng. Chem., 1958, 50, (1), 67–70).

ACCELERATED CORROSION-TESTS ON CHEMICALLY PASSIVATED ELECTROLYTIC ZINC COATINGS ON STEEL.
Tadeusz Biestek
(Corrosion et Anti-corrosion, 1958, 6, (2), 59–65; discussion, 65).

ANODIZING: OBSERVATIONS ON SOME RECENT IMPROVEMENTS.
F. Flusin.
(Alluminio, 1958, 27, (1), 13–18; discussion, 18).

STUDIES ON ELECTRODEPOSITED CHROMIUM. II. ON THE AMOUNT OF UNUNIFORMITY OF HARDNESS.
Nobuteru Awa and Osamu Fusida.
(Nippon Kinzoku Gakkai-Si, 1957, 21, (11), 625–628)—(In Japanese).

American Machinist
330 West 42nd Street
New York 36, N. Y.

Corrosion Technology
Leonard Hill Technical Group
Stratford House
9 Eden St.
London, N.W. 1
England

Electroplating and Metal Finishing
15 Udney Park Rd.
Teddington, Middlesex
England

The Iron Age
Chestnut and 56th Streets
Philadelphia 39, Pa.

J. Electrochemical Society
1860 Broadway
New York 23, N. Y.

J. Institute of Metals
17 Belgrave Square
London, S.W. 1, England

Light Metals
Temple Press, Ltd.
Bowling Green Lane
London, E.C. 1, England

Metal Finishing
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Westwood, N. J.

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PERSONALS

W. C. VanKeuren J. S. Hubbard

W. C. VanKeuren in a reassignment of sales managers of Wyandotte Chemicals Corp., J. B. Ford Division, to new locations moves from district sales manager, New York, to district sales manager, Los Angeles.

Mr. VanKeuren started as a Wyandotte salesman in the Boston district in 1945. In 1952 he was promoted to manager of the Philadelphia district and, in 1957, was named manager of the New York district.

Succeeding Mr. VanKeuren as New York district sales manager is **James S. Hubbard,** who transfers from a similar position in the Division's Boston office, a post he has held since 1954. Mr. Hubbard formerly was a Wyandotte sales representative in the Atlanta, Georgia, district from 1949 until his promotion to head the Boston area sales activities. He has an outstanding record of sales and service to customers.

The position of Boston district sales manager was assigned to **James L. Ramsey,** a former sales department head at the Michigan offices. Mr. Ramsey was a sales representative in Virginia from 1945 to 1951, when he was promoted to managerial duties at Wyandotte.

Ralph E. Kwarsick has been named sales engineer to serve the Udylite Corp.'s customers in the Chicago territory. Mr. Kwarsick is a graduate of the University of Michigan, School of Business Administration. He served in the U. S. Marine Corps for three years. He joined Udylite eight years ago to work in the Detroit office as an estimator and later in the New York office as a field estimator.

R. E. Kwarsick F. Jones

He will be operating from the Udylite Chicago headquarters at 2859 N. Natoma Avenue.

Frank Jones has been appointed director of market development of Michigan Chrome & Chemical Co.

Mr. Jones has served in the capacity of manager of Michigan Chrome & Chemical Co. Coating Division, assistant sales

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manager, Chemical Division, and sales representative for Michigan Chrome in the East.

In his new assignment, he will be responsible for developing new markets for the firm's plastisols, fluidized bed resins and other organic coatings.

Charles N. Chalfant has been appointed product manager—metal finishing by Kelite Corp.

Mr. Chalfant will be responsible for development of metal finishing sales in Kelite's Midwestern and Eastern regions.

Mr. Chalfant has been active in laboratory and sales work in the metal finishing industry for the past 30 years. He holds a BS degree in chemistry from Carnegie Tech, and is a member of the American Electroplaters' Society.

C. N. Chalfant

B. F. Walvaren

Burnham F. Walvaren has joined the sales engineering staff of Davis Supply & Manufacturing Co., St. Louis.

Mr. Walraven, who is now representing Davies in Eastern Missouri, Kentucky and Indiana, formerly was on the engineering staffs of McDonnell Aircraft Corp. and Union Electric Co., St Louis utility.

After attending the U. S. Naval Academy he served on destroyers during World War II. He later enrolled at the University of Illinois, receiving his degree in mechanical engineering. While at Illinois, he was elected to Tau Beta Pi, honorary engineering fraternity.

Jean J. Grunwald has been named research chemist of MacDermid Inc., Waterbury, Conn. He received his BS degree in chemical engineering in 1956 from Polytechnical School University, Lausanne, Switzerland, and his MS in chemical engineering at Columbia University in 1958. From 1956 to 1957 he was employed in the plastics engineering department of Northern Electric Co., Ltd., Montreal, Canada.

Mr. Grunwald worked as an AES Project 12 Fellow studying the effect of organic films on adhesion of electrodeposits. He will begin work in the Waterbury research laboratory on metal finishing problems.

Walter L. Pinner has been appointed manager of electroplating development for The McGean Chemical Co.

Mr. Pinner, previously with Houdaille Industries for 35 years, is chairman of the International Council appointed jointly by

J. J. Grunwald

W. L. Pinner

the AES and the Institute of Metal Finishing of England to organize the Fifth International Conference on Electrodeposition and Metal Finishing, a part of the June Golden Jubilee Convention of AES.

A graduate in chemical engineering from the University of Michigan, he served Houdaille Industries as plant chemical engineer, chief chemical engineer, manager of research and development, and process engineer.

He is the author of approximately 50 technical papers published through the SAE, AES, Electrochemical Society and the Journal of the Institute of Metal Finishing of England. His four gold awards for technical papers outnumber those conferred on any other author.

Mr. Pinner has served the AES nationally in many capacities and was national president in 1945. He has also held all offices of the Society's Detroit Branch. In 1949 he became the first American to be elected an honorary member of the Institute of Metal Finishing of England.

Chairman of a project committee of AES, he was instrumental in initiating the research program on the development of a dependable method of accelerated corrosion testing for plated coatings. He served last year as president of the Society's Order of Past Presidents.

At McGean Chemical, Mr. Pinner will head an accelerated research and development program.

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PATENT ABSTRACTS

DR. D. GARDNER FOULKE
Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,850,417, 9/2/58—Oxalate Coatings—H. Jenkins and D. Freeman, assignors to Parker Rust Proof Company, Detroit, Mich.

A bath for forming oxalate coatings on aluminum is described as containing essentially oxalic acid and 0.2 to 10 g/l of chlorate ion, along with a nitro compound (metanitrobenzene) sulfuric acid, 2 nitrophenol -4- sulfuric acid, p-nitrophenol and nitroguanidine) in amount sufficient to promote the formation of a coating.

16 claims.

No. 2,851,386, 9/9/58—Coating Zinc—H. Hartman, assignor to Allied Research Products, Inc., Baltimore, Md.

A method treating zinc and zinc alloy mill galvanized sheets to give a clear, protective coating consists of bringing said sheets in contact with an aqueous solution containing a chromic compound (defined as chromic acid and salts thereof) at least one boric compound and at least one metal salt of fluosilicic acid. Acid at a *p*H of 0.8 to 4.0.

14 claims.

No. 2,854,387, 9/30/58—Jet Plating—E. Zimmerman, assignor to Philco Radio Corp., Philadelphia, Pa.

A jet plating method is described in which the improvement is that a water soluble ether is dissolved in the electrolyte.

18 claims.

No. 2,854,388, 9/30/58—Plating Copper—Tin Alloys—W. Safranek and C. Faust, assignors to City Auto Stamping Company, Toledo, Ohio.

A copper-tin alloy containing over 15 per cent Sn can be deposited from a bath containing a cuprous salt, a tin salt, an alkali metal cyanide and 0.5 mol/l of halide (alkali metal, NH_4) employing a Cu-Sn alloy anode. Example I gives the bath as

$K_4P_2O_7.3\ H_2O$	90 g/l
K C N	33.5 g/l
Cu C N	18.8 g/l
$SnSO_4$	10.8 g/l
KH_2PO_4	20.0 g/l
Gelatin	2.0 g/l

3 claims.

No. 2,854,389, 9/30/58—Bright Copper Plating—E. Boelter, assignor to E. I. DuPont De Nemours & Company, Wilmington, Del.

A bright copper deposit can be obtained from a cyanide copper bath containing 2 to 50 ppm of selenium supplied as copper selenide and at least 100 ppm of methylene—bis (naphthalene sulfonic acid) and alkali salts thereof.

8 claims.

No. 2,854,395, 9/30/58—Pipe and Conduit Plating Apparatus—F. Kennedy, assignor to National Electro Products Company, Pittsburgh, Pa.

A handling and conveying mechanism for plating zinc on conduit is described.

2 claims, 7 figures.

No. 2, 854,737, 10/7/58—Coated Uranium Article—A. Gray, assignor to USA (AEC).

A metallic uranium article is claimed where it is protected by successive layers of copper and lead.

See also No. 2,854,738 describing a cupro-nickel alloy bonded to the uranium-nickel alloy bond (5 claims).

6 claims.

No. 2,854,739, 10/7/58—Coated Molybdenum Article—K. Bartlett and P. Turner, assignors to Thompson Products, Inc. Cleveland, Ohio.

Molybdenum parts subject to oxidative corrosion are overlaid with zirconium then with chromium and finally a nickel-base alloy.

1 claim.

No. 2,855,332, 10/7/58—Chromizing—G. Samuel—assignor to Metal Diffusions, Inc., Philadelphia, Pa.

Claim 1 reads:

The method of chromizing, which comprises reacting ammonium bifluoride with chromium in watery solution to form a complex ammonium chromium fluoride, with an excess of chromium, coating the watery dispersion thus formed on a ferrous metal article to be chromized, and heating the article with exclusion of air at a temperature of from 1650 to 1950F for a time of at least three hours.

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No. 2,855,348, 10/7/58—Chromium Plating—T. Topelian, assignor to Tiarco Corp., Newark, N. J.

Lead and zinc articles may be plated with chromium by treating in a solution of chromic acid (36-44 oz), phosphoric acid (800 to 1200 ml of 85 per cent), and hydrochloric acid (700 to 1100 ml of conc.), rinsing, then placing in a chromium bath and plating.

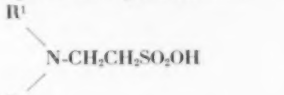
6 claims.

No. 2,855,350, 10/7/58—Anodizing—R. Ernst, assignor to Sanford Process Company, Inc , Los Angeles, Calif.

The use of 2-aminoethyl sulfuric acid as an addition agent to an anodizing bath is claimed.

20 claims.

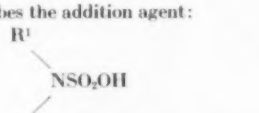
No. 2,855,351 describes the use in addition to the anodizing acid compound a compound having the formula:



where R^1 and R^2 are H, alkyl or cycloalkyl with less than 8 carbon atoms

25 claims.

No. 2,855,352 describes the addition agent:



where R^1 and R^2 are as for No. 2,855,351 used in an anodizing bath where an anodizing acid is the major component. The addition agent is present at 0.02 to 0.1 ml/l.

25 claims.

No. 2,856,275, 10/14/58—Chemical Treatment of Metal Surfaces—G. Otto, assignor to Amchem Products, Ambler, Pa.

A pickling bath for titanium and zirconium is described as H F (1 to 6 per cent) HNO_3 (10 to 50 per cent) and a minor amount of a compound selected from chloride (K,Na,NH_4) chlorates, hypochlorites (Na and K) and peroxide of hydrogen

6 claims.

No. 2,856,312, 10/14/58—Treating Metal Surfaces—R. Nowak, Frankfort and E. Hasse Dusseldorf, Germany.

The method consists of oxidizing and reducing the surface, then treating with a metal treating agent acting by heterogeneous chemical replacement by an element (vapors of subhalogenide of element).

18 claims.

No. 2,856,313, 10/14/58—Plating Quartz Crystals—P. Gerber and W. Schafer, assignors to USA (Army).

Heat crystal to from 500 degrees to inversion temperature in an evacuated chamber, plate in said evacuated chamber and heat-treat under vacuum.

6 claims, figure.

No. 2,856,321, 10/14/58—Presenting Oxidation of Metals—R. Parson and J. Truckler.

Claim 1 reads:

A method of preventing oxidation of the interior surface of a hollow ferrous metal article which comprises subjecting said surface to the action of di-ammonium phosphate to form on the surface a film of a salt of the metal by reaction of the phosphate radical therewith and produce adjacent the surface a gaseous ammonia atmosphere evolved from the ammonium radical.

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1500/750 Amp., 6/12 volt, **Elect. Products,** 15 HP, Synch. motor
1000/500 Amp., 6/12 volt, **H-VW-M,** 10 HP, Sq. Cage Motor
1000/500 Amp., 6/12 volt, **U. S.,** 10 HP, Sq. Cage motor
1000/500 Amp., 6/12 volt, **Bodine,** 10 HP, Sq. Cage Motor

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BRANCH NEWS

Total AES Branches U. S., Canada Australia, February 1, 1959—58.

BALTIMORE-WASHINGTON

Panel Confronted with Plating Problems

The January meeting of the Baltimore-Washington Branch of the American Electroplaters' Society was held Tuesday evening, Jan. 13, in the Chemistry Lecture Room at the Bureau of Standards, Washington, D. C.

The meeting was a Question and Answer Session with a panel of experts supplying the answers. The panel consisted of **William Bresnick,** The Martin Company, Baltimore, Md.; **Kenneth Huston,** ARMCO Steel Corporation, Baltimore, Md.; **Dr. Vernon Lamb,** Bureau of Standards, Washington, D. C.; **Arthur Pierdon,** Art Metal Finishing Company, Washington, D. C.

A number of interesting questions and problems were presented by the members and their guests.

Harold W. Scott
Secretary

BOSTON

Bright Copper Plating Presented by Bikales

Boston Branch met Thursday, Dec. 4, 1958 at the Hotel Statler-Hilton, Boston, with Pres. **Wright** in charge. Four applications for membership were processed.

Librarian **Martin** presented **Richard Bikales** of Metal & Thermit Corp. who discussed "Bright Copper Plating and the Use of Neochel."

The trend to heavier copper deposits was pointed out as one of the reasons for obtaining a bright copper on steel to eliminate buffing costs and the increased intricacy and high polish required on die castings likewise required a bright copper to improve the luster of the deposit.

It was shown that this method produced an excellent base for nickel acting as a barrier layer insulating against acid attack from the nickel solution.

Minor changes from previous copper formulations were indicated and graphs were used to show how the cathode efficiency compared with conventional baths. Anode efficiency was treated likewise. Polarisation causes, effects and methods of elimination were discussed together with a comparison of Rochelle salts with a newer product.

A lengthy question period brought out further points of direct interest concerning operating points.

George P. Swift
Secretary

BOSTON

Danek Discusses Waste Treatment

Boston Branch met Thursday, Jan. 8, at the Hotel Statler-Hilton with Pres. **Wright** in charge.

The secretary's report was read and accepted. In view of the action of the Executive Board concerning Branch Exhibits at the Detroit Exposition, it was voted that Boston Branch withdraw completely from any exhibit of any type. The decrease in Research Sustaining Memberships was discussed together with the new membership drive and booklet for ordinary members. It was recommended that the membership chairman and salesman for the various distributors and supply houses obtain more of these booklets and application blanks from **John P. Nichols** at Newark to be used with prospective members.

George Marotta presented **L. Danek** of Industrial Filter and Pump Mfg. Co. who as their technical sales representative discussed "Treatment of Typical Waste from Plating Rooms." The first discussion dealt directly with the three basic problems of A) acids and alkalies, B) cyanides and C) chromium problems. After a direct batch treatment recommendation for each type, it led naturally to a semi-continuous and finally to a continuous method of treatment. A model copper, nickel and chromium plating cycle was used as an example with discussion of quantities of rinse water as well as dragout and the methods of treatment and recovery if any. De-ionizers were discussed along with evaporators.

George P. Swift
Secretary

BRIDGEPORT

Regional Educational Topics Suggested

The regularly scheduled business meeting and educational session of the Bridgeport Branch was held in the main ballroom of the Hotel Barnum on Friday, Jan. 9. President **Michael Tamas** called the meeting to order. Thirty-one members and guests were present.

Publicity of branch activities is being obtained in local papers.

James McGrath has been in the hospital.

Mike Tamas reported that other branches had reported progress for the New England Regional and he canvassed the Bridgeport Branch for views concerning the subjects to be presented at the educational session. Various subjects were suggested which are to be considered by the committee.

George Wagstaff reported through the secretary that he had initiated plans and was contemplating entertainment suitable for Olde Tymer's Nite. **Emil Bergen** and **Al Jocis** were asked to assist him as members of the committee.

Frank Kalafus reported the Christmas dinner dance both a social and financial success.

The door prize was won by **Mike Marino** of Contract Plating Co.

The bylaws were read to the assembly. Proposed changes were discussed and voted upon. They will be presented for final approval at the next meeting.

Refreshments were served at the end of the evening.

Bob Parker

BRITISH COLUMBIA

Tour Plywood Plant

The general meeting on Jan. 21 was scheduled as a plant tour through the sawmill and plywood plant of the Canadian White Pine Division of MacMillan and Bloedel Limited. Unfortunately, because of inclement weather, only seven brave members attended. The tour, however, did prove to be both very interesting and educational proving most worthwhile for those who came out.

There was no business conducted at this meeting and the tour was completed at 9:45 p.m.

N. A. Shepherd
Secretary

CHICAGO

Dr. Brown Talks on Deposition of Bright Metal Plates

The January meeting of the Chicago Branch was a joint meeting with the Electrochemical Society. The meeting was held on Friday, Jan. 9 at the Chicago Engineers Club, 314 South Federal Street at 8:00 p.m. A very good turnout of members from both branches were present at the meeting. **R. Scott Modjeska** introduced the speaker of the evening **Dr.**

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

Henry Brown, research director of The Udylite Corporation. Dr. Brown, following graduation from the University of Kansas, received a Doctors' degree from the University of Michigan. He has been with the Udylite Corp. for some time except during World War II when he worked on the Manhattan Project. Dr. Brown spoke on "The Mechanism of Electrodeposition of Bright Metal Plates" illustrated by slides and blackboard sketches.

Dr. Brown commenced his talk with a general discussion of the properties and structure of metals. Addition agents that are used to brighten nickel plate must have the double bond linkage such as the ethylene group— $\overset{h}{\underset{h}{c}}=\overset{h}{\underset{h}{c}}$ or the $=C—SO_2$ group. Sulfur (0.03 per cent) and carbon (0.05 per cent) with a small amount of hydrogen and oxygen are found in the bright nickel plate. The addition agents react with the 110 face of the nickel crystal, which is very active catalytically, to form a bright plate. Proteins such as glue and gelatin, have large molecules, and exert a pronounced effect on the crystal size of lead and cadmium plates from their respective acid plating baths. The use of this type of addition agent in the acid baths results in having a very fine grain, dense type of plate.

Slides were used to illustrate the pitting that occurs between layers of dull nickel and chromium, bright nickel and chromium, use of high temperature chromium bath (65C) with a visible decrease of pitting, nickel and chromium plus a repeat of nickel and chromium. Dr. Brown pointed out how pitting stopped or progressed depending upon the plating method used. For example: when the chrome-nickel-chrome method was employed, the pits would grow laterally along the nickel layer and would not move downward toward the base metal (steel). Samples represented by the slides were shown to illustrate the protection given by above plating methods. After a question and answer period, Dr. Brown received a rising vote of thanks for his very informative talk.

Christopher Marzano
Publicity Chairman

CINCINNATI
Clements Discusses Corrosion Testing

The Jan. 28 meeting was called to order by President **Helmich,** with 31 members and guests present.

Six applications for membership were approved.

Roger Winterman reported that he has tickets for the Tri-State affair at Louisville on April 4, 1959.

The picnic committee consisting of **Ray Barry,** chairman, **Jack Pfeiffer** and **Dick Snodgrass** was appointed by the president.

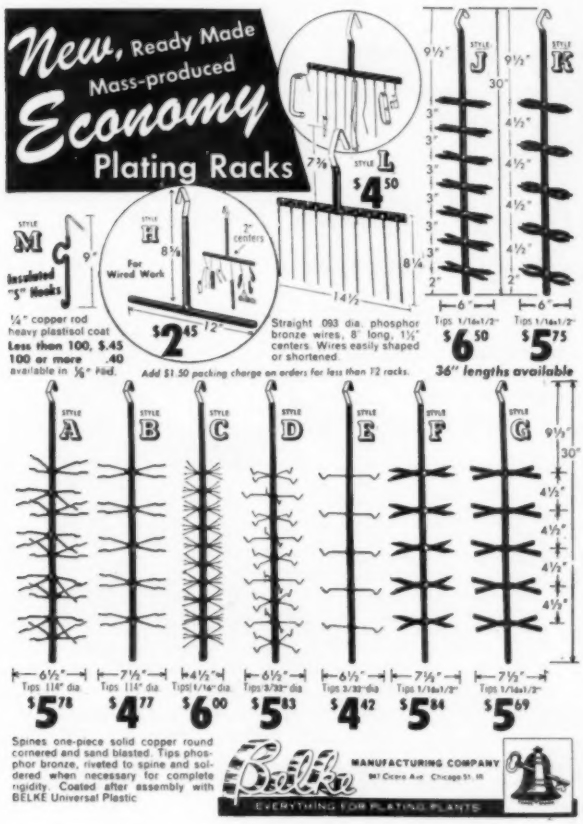
Stanley Clements, of Industrial Filter and Pump Manufacturing Co., was the speaker of the evening. Mr. Clements discussed the various methods of accelerated corrosion testing on inorganic coatings. He discussed the operation of the neutral salt spray, acetic acid salt spray and the Corrodkote test, giving the background of their developments and pointing out some of the special features of the various tests.

After a question and answer period, the group adjourned and enjoyed the social hour sponsored by the Pennsalt Chemical Co.

David L. Kaplan
Secretary

CLEVELAND
Helbig Talks About Activated Carbon

The Cleveland Branch held its Jan. 9 meeting at the Cleveland Engineering Society Building. **Gordon Carlson** introduced the speaker of the evening, **W. A. Helbig.** Mr. Helbig, a chemical engineer, is associated with the Atlas Powder Co. He discussed the many uses of activated carbon in various industries and, more specifically, the role which activated carbon plays in the purification of plating solutions. He stressed the importance of



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knowing the nature of the impurities and the characteristics of the filtering system in order to use this material to its greatest advantage. The discussion which followed brought up the point that the material is difficult to handle and creates a problem with dusting. Mr. Helbig said that he was aware of this trouble, but that due to various conditions it was extremely difficult to correct.

President **Bob Peters** opened the business meeting. **Hank Sedusky** stated that final preparations are being made for the dinner-dance on Jan. 31.

The educational session which precedes the dinner will start at 1:30 p.m. Chairman of this session will be Gordon Carlson, librarian of the Cleveland Branch.

Dr. M. H. Jones will talk on "The Effects of Basis Metal on Corrosion." Dr. Jones is with the Ontario Research Foundation.

John A. Swift of the John Swift Chemical Company will lecture on "What the Platers Should Know About the Metallurgy and Manufacture of Steel."

George A. Shepard
Assistant Librarian

COLUMBUS
Porcelain Enameling
Presented by Grant Miller

The regular monthly meeting of the Columbus Branch AES was held at Ricardo's Restaurant on Friday, Jan. 9, at 6:00 p.m.

The business meeting was called to order by President **Harry Moore.**

Nate Koslin told of the annual CTC dinner meeting to be held at Winding Hollow Country Club on Thursday Feb. 26.

Librarian **Les McGraw** introduced the speaker of the evening, **Grant E. Miller** of Frit Division, Ferro Corporation, whose subject was "Use of Porcelain Enamel on Aluminum in Industry." Mr. Miller gave a very interesting talk on porcelain enameling on steel and aluminum.

Following a question and answer session, and a round of applause for the speaker, the meeting was adjourned.

Halvor S. Christianson
Secretary

DALLAS-FT. WORTH
Jones Speaks on Chemical Milling

The regular monthly meeting of the Dallas-Ft. Worth Branch was held on Tuesday, Nov. 25, 1958 at the Lennox Hotel in Grand Prairie. **W. J. Jones,** process control production supervisor with Convair presented "Metal Finishing Aspects Associated with Dynamic Etching of Metals." Mr. Jones gave the very attentive audience some basic fundamentals involved in dynamic etching or chemical milling of steels, aluminums, and magnesium alloys. Colored slides depicted intricate shapes being dynamically etched into metals for use in the Convair B-58 supersonic bomber. Many questions on techniques, finishing, and limitations of the processes were posed and aptly answered by the speaker. Particular interest stemmed from the members in considering this new process an integral part of the metal finishing industry in the Southwest.

The business meeting was brought to order by President **Myron Browning.** Librarian **Ted Betz** introduced the guests. **Doug Cox** suggested we persuade the membership committee to invite local chemical milling firms to consider affiliation with the society. **Tom Norris** reported that the membership committee had three candidates for membership. The candidates were introduced and voted membership. **Tom Foy,** representing the entertainment committee, reported that accommodations for the proposed December Christmas Party were fast fading. It was agreed that the fate of the party be left up to the entertainment committee with the provision that if events proved unsatisfactory for the affair at this time, it be moved to a spring occasion.

A motion for adjournment was made by **Earl Turns.**

A. C. Fricke
Secretary

DALLAS-FORT WORTH
Sherwood Presents Paper on Electroless Nickel

The Dallas-Ft. Worth Branch held its

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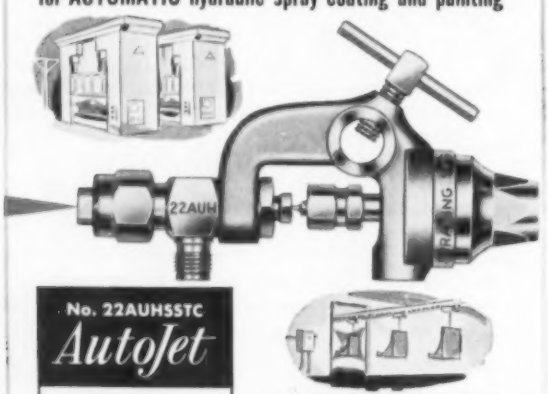

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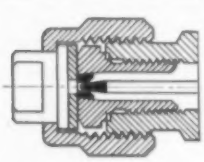

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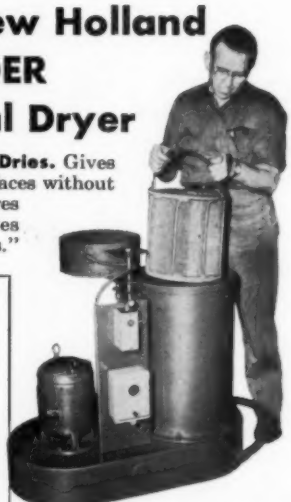

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NEW HOLLAND MACHINE COMPANY
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December meeting Wednesday, Dec. 17, in the Zodiac Room of the Lennox Hotel in Grand Prairie. The meeting was called to order by President **M. E. Browning** with approximately 40 members and guests in attendance. Representatives from the ASM and SAMPE were present as dinner guests. Secretary **A. C. Fricke** introduced our guests.

E. R. Rinehart suggested that our delegates and alternates be instructed to convey to the National Convention the "new found" spirit of metal finishing and electroplating evident in the Southwest. A brief review of areas of interest in aircraft metal finishing in the Dallas-Ft. Worth area was forwarded by **W. L. Aves.**

Second Vice President **M. T. "Tommy" Norris** reported that the membership committee was making excellent progress in its program to acquaint new prospects with the AES. **T. E. "Ted" Betz** introduced the candidates and they were voted acceptance.

Bert J. Sherwood, president and technical director of Chemplate Corp., Los Angeles, presented a very worthwhile paper on Electroless Nickel. Mr. Sherwood, who has spent considerable time in the technical development, production processing, and engineering aspects of Chemplate electroless nickel, presented a two phase discussion. The first dealt with primary considerations necessary in using electroless nickel with emphasis on design, finish, and completeness of coverage. The second phase was technical, revealing some of the complexities necessary in bath formulation. Chemplates development of "strippers" for electroless nickel on various basis metals and high adherence plating of electroless nickel on magnesium-thorium concluded the presentation.

A lively discussion headed by **John Lane** completed the liberal education on nickel plating by chemical means.

D. L. Allie entertained a motion for adjournment.

A. C. Fricke
Secretary

DAYTON

Dr. Brenner Talks on NBS Investigations and Shows Slides of Russian Trip

Thirty-one members and guests of the Dayton Branch braved torrential rains on Jan. 21 to greet **Dr. Abner Brenner,** chief of the Electrodeposition Section, Chemistry Department, National Bureau of Standards, Washington, D. C.

Dr. Brenner gave a brief history of his section and mentioned that this section was originated about 40 years ago by Dr. Blum. It is now composed of about 20 people and acts as a consulting agency for other Bureaus. The problems investigated range from practical to fundamental.

As an example of a practical investigation, Dr. Brenner reviewed some recent work for the Bureau of Engraving and Printing. New rotary presses are being installed to replace the old flat-bed presses and require curved nickel printing plates. All commonly known nickel solutions gave a plate which was either too soft or too brittle, Watts nickel being about 180 Vickers whereas 300 Vickers was desired but with sufficient ductility to form over a ¼ in. radius. These desired properties were obtained from a Watts bath containing small additions of benzine disulphonate.

Another investigation described by Dr. Brenner was that of a nickel-aluminum alloy deposit used to protect molybdenum from salt water corrosion and oxidation at 500C. The article is first plated with nickel, then with aluminum in a fused salt bath. The aluminum fuses into the nickel as it forms. The alloy coating has a hardness of 700–800 Vickers (Cr 900) and stays hard after heat treatment whereas chromium softens to 200.

As an example of fundamental research, Dr. Brenner described some of the work done on AES Project 13, Porosity of Coatings.

Following his talk, Dr. Brenner showed a series of stereo-color slides which he took during his visit to Russia last spring when he attended the Moscow Conference on Corrosion and Protection of Metals.

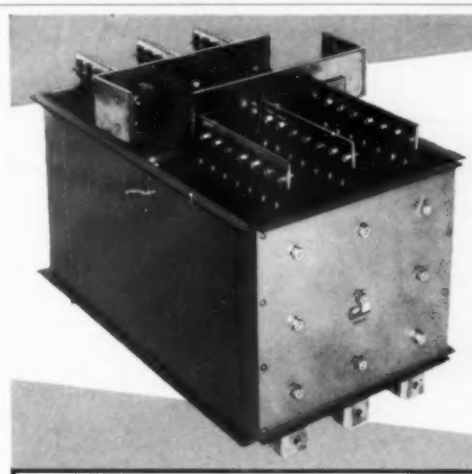
A social hour followed the meeting during which refreshments were served through the courtesy of the F. B. Stevens Co. and their local representative, **Harry M. Brown.**

L. A. Critchfield
Publicity Chairman

DETROIT

Bockris Speaks on Project 16; Stag Day Date Set

On Friday evening, Jan. 9 the Detroit Branch of the American Electroplaters' Society had a joint meeting with The



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Electrochemical Society of Detroit, with **Vincent Cassidy,** of Ford Motor Co., acting as technical chairman. **Dr. J. O'M Bockris,** of the University of Pennsylvania, spoke on the subject, "The Mechanism of Electrodeposition," AES Project No. 16. The meeting, held at the Statler-Hilton Hotel, was well attended. Refreshments were served following the meeting.

The meeting notice announced the election of six new members to the Detroit Branch and a new total membership of 683. It also announced three in-transfers.

Prior to the meeting, an executive dinner meeting was held. It was attended by executives of the Detroit AES Branch together with several officers of The Electrochemical Society.

John B. Hitchcock, chairman of the 1959 Stag Day, announced that Stag Day would be held on Aug. 22. Several locations are being considered but no definite decision has been made yet.

Theodore K. Friedt, ticket chairman of the Christmas Party, reported a profit from the Christmas Party.

Donald M. Bigge gave a financial report on the Detroit AES Handbook publication. He reported that 70 firms advertised in the handbook and that, as usual, the credit balance would be turned over to the local Branch.

Edward J. Kubis, secretary-treasurer, reported on a letter received from the Western Ontario Branch inviting the Detroit membership to attend their annual Ladies Night Dinner Dance to be held Friday, Jan. 16. Mr. Kubis also reported on the receipt of a letter from **H. E. Nice,** Detroit Branch manager of the Harshaw Chemical Co., which announced the transfer of one of their sustaining members from Chicago to the Detroit Branch.

R. C. Trees
Publicity Chairman

HARTFORD

Brandt Discusses Barrel Finishing

The regular Branch meeting was held at the Hotel Bond Jan. 19th and 53 members and guests were present.

The guest speaker for the evening was **William Brandt,** vice president of The Lord Chemical Corp., whose subject was "Precision Barrel Finishing and Finishing by Controlled Vibration."

This is a new approach to precision barrel finishing by the use of a machine employing controlled vibrations to produce faster, better and more economical results on metals, plastics and wood. It is used on cast, forged, machined and stamped parts to clean, debur, grind, descale, fine finishing and burnishing. Works 10 to 100 times faster than regular tumbling barrels-parts, can be fixtured also and the time cut from one-half to one-quarter of the time normally required. This method is good for shielded areas and internal surfaces, and on parts subject to distortion. The action does not depend on slide as in the conventional barrels, but the whole work load is always in motion, giving a rotary action to entire load and producing a scrubbing action that is gentler on parts that would distort. No distortion is produced because of the relative absence of gravity pressure force.

Many samples of parts finished by this method were exhibited and a short movie illustrating the machine in operation was shown. This talk was very well received by the members and quite a discussion took place on members questions after the talk was over.

The technical chairman for the evening was **Arthur Logozzo.**

Stanley Platoz
Secretary

INDIANAPOLIS

Bruck Moderates Discussion

Thirty-three members and guests of the Indianapolis Branch met at Fox's Steak House on Jan. 5 for the monthly meeting. After the introduction of the members and guests, **Paul Johnson,** Branch librarian, turned the meeting to **Ed Bruck,** who acted as moderator of a panel discussion period. The panel members were **W. P. Karash** of Hawshaw Chemical Co., **Dr. A. Max** of RCA, **B. E. Haucisen** Metal Finishing consultant, and **A. M. Howard** of Steel Protection & Chemical Co. In an hour-and-a-half, quite a number of questions on metal finishing were discussed.

Following the conclusion of the forum, **John Hood,** Branch president, opened the meeting.

Les Reynolds of the AES Membership Committee made a few remarks on the new membership application and the new membership booklets. The problem of selling memberships to job platers was discussed. Les then introduced **Lee Howald,** secretary of the Tri State Region, who made a few remarks on the coming Tri-State in Louisville on April 4. The general purpose of the Tri-State meeting was explained for the benefit of the newer members.

Two applications for membership were received and accepted by acclamation. Two members have been received by transfer.

The secretary reported on a board of managers meeting held Dec. 27, 1958. Discussion at that meeting covered possible recommendations for amendments to the constitution and bylaws of the Tri-State Region and the nomination of **Bert Hawhee** and **Bob Stewart** as candidates for junior representatives to the Tri-State. The election to be held at one of the Branch meetings before April.

Ed Bruck reported that **Tom Evans,** who recently suffered a coronary, is improving.

Flowers from the Branch were sent for **Roman Bender's** father, who passed away on January 3rd. Roman's father had been actively associated with the plating industry for 55 years.

Les Reynolds moved that the Branch send a delegate to the Interim Meeting in Atlanta, Georgia, on Feb. 14. The motion was seconded by Bert Hawhee and passed. A ballot of the members was taken and delegate Addison Howard was selected to represent the Branch.

The Meeting adjourned at 10:25 p.m.

A. M. Howard
Secretary

LOUISVILLE
Kennedy Speaks on Cyanide Plating Problems

The regular meeting of the Louisville Branch was held on Jan. 15 at Hasenour's Restaurant with 20 members and four guests present.

Ken Reifsteck presented a short resume of our progress on the planning for the Tri-State Regional Meeting to be held in Louisville on April 4.

Paul De Haven, representing the Kentucky Plating Co., gave a short history of his firm's operations. At each meeting we are endeavoring to have each industry represented by our membership present a short talk on their respective plants.

After the business session, **Herb Kennedy** of the E. I. duPont deNemours Co. presented an interesting slide discussion on the "Effects of Impurities in Cyanide Plating Solutions." Mr. Kennedy discussed the various types of contaminations that could be present in a bath and presented various methods of combating such intruders.

After a short question and answer session, the meeting adjourned for refreshments.

L. W. Dawson
Recording Secretary

MILWAUKEE
Logue Presents Paper on Detergent Chemistry

The 494th regular meeting of the Milwaukee Branch on Dec. 5, 1958 was called to order by President **Frank Marshall.**

Two new members were presented.

Two applications were presented for approval of the members. Both were accepted.

Cy Taterzynski reported for the membership committee that it is imperative all members be properly notified of coming events and also that new members be made to feel "at home." The committee is to make a survey of the industry in the region and all prospective members be invited to the February fifty year Anniversary surprise meeting.

Sam Audenby of the school committee reported that the Electroplating School was ready to start and all interested members should contact **George Strombeck.**

Walter Higgs presented **Eugene Logue** of Solventol Products. Mr. Logue spoke on "New Horizons in Detergent Chemistry."

After the question and answer period following the talk, refreshments were served.

Fred F. Padgett
Secretary-Treasurer

MILWAUKEE
Dr. Saubestre and Meagher are Speakers; 34 Students in Electroplating Class

The 495th regular meeting of the Milwaukee Branch was called to order by President **Frank Marshall.**

A letter from National Headquarters regarding the Detroit Exposition was read to the Branch. After discussion it was decided that the Milwaukee Branch would exhibit and the Committee headed by **R. J. Steuernagel** was instructed to plan accordingly.

Three new applications were voted on and accepted.

A report was made by **E. Weiss** that a change in the Annual Meeting would be made this year. The educational sessions are to be held in the afternoon instead of the morning.

Hilton Smith reported that the first electroplating class was held with a total of 34 students present. Upon completion of the course, each graduate will receive a certificate. Discussion was held on what the Branch would offer to the graduates, and a number of ideas were presented.

Les Diveley reported that, one Branch did not ratify the Midwest Council bylaws and a total of seven was needed. The Milwaukee Branch was asked to vote on the following amendment: The Milwaukee Branch will support and become a member of the Council regardless of the number of Branches joining. The motion was carried.

A minute of silence was held for **Henry Binder** who died on Jan. 5.

An announcement was made by **Glen Schwemer** on the next Pabst meeting as follows: It will be the 25th Walter Pinner meeting and is to be held on June 5, 1959. Plans are being made for a special meeting this year.

Walter Higgs presented the following speakers: **Dr. Edward B. Saubestre** who spoke to the inorganic section on, "Electroless Plating" and **Joseph Meagher** who spoke to the organic section on "What are Silicones."

Frederick F. Padgett
Secretary-Treasurer

MOHAWK VALLEY
Blount Talks on Plating Costs

The meeting was opened by President **C. A. Bridgett** who welcomed friends and guests. He turned meeting over to **R. A. Stewart** to report on the enjoyable

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INDICATE A 345.

Christmas Party participated in by a sizable group. He also reported that a dinner-dance will be arranged for May.

President Bridgett announced that **Carl Fenner** had asked to be relieved as secretary-treasurer due to his extensive work schedule. A vote of appreciation was given to Carl for the fine work done for our Branch.

Charles Rachm Jr. announced that **Henry J. Crouse** has been appointed secretary-treasurer. Mr Crouse stated that he was honored and would do his best to fulfill this obligation.

Jack Benson announced that chrome plating would be the topic for next month's meeting.

Frank Czech introduced **Ezra A. Blount,** editor of Products Finishing who spoke on Plating Costs. Mr. Blount cited the wide variation of comparative costs in a group of job shops that had been surveyed. He called attention to the many elements that must be accounted for in arriving at true costs. He so stimulated our thinking that a number of questions were asked and answered.

H. J. Crouse
Secretary-Treasurer

MONTREAL

Reisenburg Sr. Demonstrates Ultrasonic Cleaning

The regular monthly meeting of the Montreal Branch was held at the Sheraton Mount Royal Hotel on Jan. 12, at 8:30 p.m.

The meeting was called to order by President **J. Serbeniuk,** with 28 members present.

Mr. Serbeniuk called upon **B. Scott** to introduce **J. T. Reisenburg Sr.** of Lea Products Company, our speaker for the evening. Mr. Reisenburg gave a very enlightening talk and interesting demonstrations on Ultrasonic Cleaning. He was thanked on behalf of the Branch by **M. Cohen.**

J. T. Reisenburg Sr. moved that a vote of thanks be given to members of the Annual Dance Committee for the wonderful job they had done.

The meeting adjourned at 10:45 p.m.

R. W. Niggemann
Secretary-Treasurer

NEWARK

Shyne and MacArthur are Speakers

President **Bittrich** called the Jan. 16 meeting to order with 55 present in spite of a snow storm.

Don Foulke announced the New York 50th Annual Meeting and urged that a large contingent of Newark Branch members attend the New York Educational session and banquet. Two Christmas cards received by the Branch were displayed, one from **Ernest Hinterleitner** Newark's most distant continental member and one from **Hee Taek Yum** of Korea, the most distant member.

Three membership applications were accepted and one member was elected.

Fred Meyer reported the Christmas Party had been a success and **John Banta,** chairman of the membership committee urged that each member bring in new members and outlined steps to take. He also reported that plans for Ladies Nite in April were well along and urged all to plan to bring a wife or sweetheart to this meeting.

Paul Santella, a long time member of the Branch, was elected first Emeritus Member under the newly adopted bylaws.

Don Foulke reported the sudden passing of **Van Winkle Todd,** one of Newark Branch's oldest members, on Jan. 15. A moment of silence was dedicated to his memory. **George Wagner** and **Mario Di Chiara,** under-the-weather Newarkers, were reported as on the way to recovery.

Librarian **Al Korbelak** presented **James J. Shyne** of Reaction Motors who discussed "Electrophoretic Coatings." Jim explained electrophoresis is useful for depositing coatings of uniform thickness on complicated shapes and that this technique can be used to deposit metal-metal oxide and cermet coatings. For such applications a metal-metal oxice mixture is suspended in a non-aqueous medium (alcohols 2-nitropropane, etc. by ball milling usually then a high voltage dc (100–500 v) is applied whereupon the particles having received a charge migrate to the anode or cathode (usually the cathode), depending upon the preparation. Coating thicknesses of 0.005 to 0.010 in. can be laid down in 3 to 5 minutes at 300 volts using a zein suspension at 0.1 to 1.0 asf. The process is characterized by high throwing power. After electrodeposition the part is air-dried and later densified by hydrogen reduction. Jim concluded his talk with a film showing Reaction Motors latest half-million horsepower jet motor following

Conn produces the "heart" of good tone quality by electrodeposition, with "Plus-4" Copper Anodes

In a cornet or trumpet, good tone and easy playing depend largely on the inside shape and finish of the tone chamber (mouthpipe).

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Using "Plus-4" Phosphorized Copper Anodes in its acid-copper electroplating tanks, Conn has found it gets the smooth, dense deposit it needs. The build-up of metal is fast and uniform; "Plus-4" Anodes' extra "throwing power" being of particular value with the tubular shapes. There are few nodules, which minimizes finishing of the outside surface. And tank maintenance is simplified.

Conn also forms the bells used in cornets, trumpets, and trombones electrolytically. This gives still further control in the precision of the entire inside tone columns of its instruments — for increased resonance and live, powerful tone.

WRITE FOR INFORMATION on how you can obtain a test quantity of "Plus-4" Anodes to supply one tank. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

Top Right: Conn Electro-D Tone Chamber (mouthpipe) cut away to illustrate the "micro finish" interior surface. Chamber and mouthpiece receptacle are formed in one piece by electrodeposition; were previously two pieces soldered together. (Patent pending.)

Bottom Right: Electro-D Bell, also formed by electrodeposition.

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"PLUS-4"® ANODES Phosphorized Copper

Made By The American Brass Company

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which a number of questions were answered.

H. E. MacArthur of Conforming Metrix Co. in Toledo returning to his home town discussed "Application of Multicolor Materials Using Permanent Type Masks." By means of a color, talkie film Mr. MacArthur described how electroformed metal masking shields (Ni and Cu) were serving the painting industry. The various applications were outlined; the equipment for masking, painting and cleaning of masks was described and typical masks were displayed. In the question period following the film many of the details were given and the relative advantages of permanent type masks versus silk screens were discussed.

The meeting closed with a rising vote of thanks to both speakers for an interesting evening after which the Newark members pushed their way through the revolving doors of the Robert Treat into the wind-borne snow of a cold January night to find a winking moon guaranteeing a safe, schnell trip home, instead of the slippery, snowy ordeal anticipated.

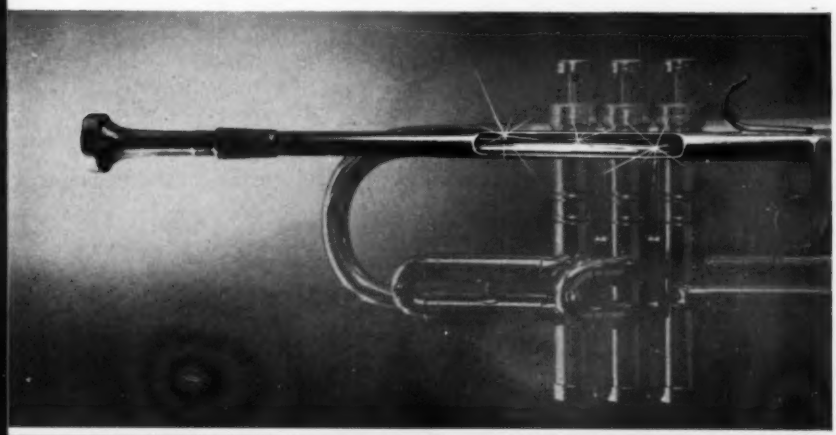
D. Gardner Foulke
Secretary

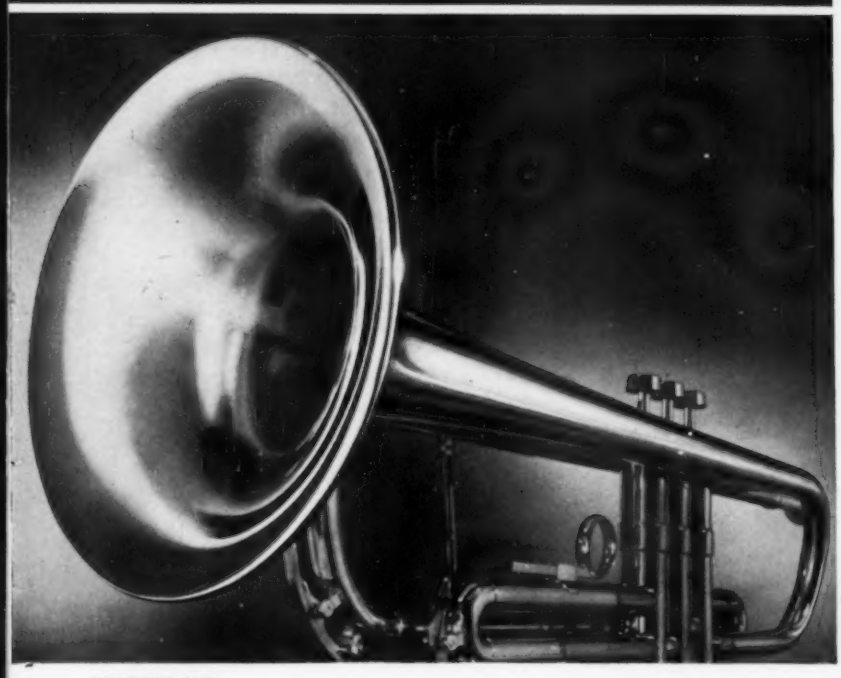
NEW YORK
Thickness Measurements Discussed by Packman

After the Jan. 9 meeting of the New York Branch at the Hotel Statler, **Art Carlson,** librarian, introduced the speaker, **Lou Packman** of the Platers Research Corp., who discussed "Plating Thickness Measurements." Mr. Packman reviewed the various principles, methods and equipment used in the measuring of coatings on metals and non-conductors.

The use of the Dermitron, non-destructive thickness tester based on the eddy current principle of measurement, evoked an informative discussion. Various members present told of case history uses of the Dermitron thickness tester. A considerable interest was voiced in the use of this instrument in rapid testing of anodic coatings on aluminum and magnesium with an accuracy of 5 per cent.

Anthony P. Briganti
Recording Secretary





PHILADELPHIA
Ultrasonics Presented by Schwartz and Rand

The regular meeting was held at the Engineers Club on Jan. 26; 45 were at dinner and 65 attended the meeting. The minutes of the previous regular and officers meetings were heard; eight membership applications were received, also one in-transfer. Guests and the members of **Dr. Heiman's** electroplating class were introduced. Dr. Heiman announced that by popular request the class was being continued for a spring session. The treasurer gave his report.

The secretary read copies of letters being sent to the Supreme Society, inviting the 1960 Interim Meeting and the 1965 Convention to be held in Philadelphia.

Mr. Hauseman, Librarian, introduced **Daniel Schwartz,** Gulton Electronics, who spoke on the theory of ultrasonics as applied to electroplating and cleaning. By the use of piezoelectric crystals, electrical energy is changed to ultrasonic waves, which vibrate at frequencies ranging from 20 to 400 kilocycles (beyond the audible, range). Barium titanate is widely used, enclosed in hermetically sealed units or bonded to the tank walls. This portion of the equipment actually delivering the ultrasonic waves are called transducers. The mechanics of the ultrasonic operation in liquids is cavitation; this takes place at the interface of the different materials. In electroplating the intense cavitation at the cathode surface overcomes polarization allowing higher current densities to be used without the use of addition agents. Ultrasonics also prevents excess of deposit build-up at high C.D. areas.

Burton Rand, Metalclean Equipment Co., then spoke of practical uses of ultrasonics in surgery, defoaming, emulsifying, welding, soldering, cleaning and degreasing. With portable equipment, he demonstrated the ability of an ultrasonic degreasing unit, using trichlorethylene, to remove completely from automatic machine buffed brass parts all traces of tripoli and rouge compounds from the surface, including recesses, corners and threads, leaving a surface suitable to receive a clear, organic finish.

I. Wm. Marcovitch
Secretary

PITTSBURGH
Ladies Night Planned; McOmber Is Speaker

The first Pittsburgh Branch meeting of 1959 was held at the Gateway Plaza, downtown Pittsburgh.

One new member was elected.

President **J. R. Crain** announced tentative date of May 2, 1959, for Ladies' Night.

Librarian **C. A. Forbes** introduced **L. W. McOmber** who spoke in place of **R. R. Bair.** Both are of E. I. duPont de Nemours and Company. The topic, most interestingly presented, was "The Effect of Impurities in Cyanide Plating Baths."

E. B. Keller
Secretary

ROCHESTER
Spear Presents Printed Wiring Techniques

The January meeting of the Rochester Branch, was held at the Rochester German Club. The meeting was called to order by President **Frank Beuckman.**

The Christmas party held at the Midvale Country Club was a great success and many thanks go to the party committee and chairman, **"Tyc" Moffatt.** President Beuckman proposed that a committee be formed to check into the lagging attendance at regular meetings to see if a change of meeting nights or place might help to bolster attendance.

The speaker of the evening was introduced by Librarian **Ed Penczek. Donald Spear** of the Eastman Kodak Company represented the graphic arts sales department of that company.

He gave a very interesting talk, well illustrated with movies of printed wiring techniques. Mr. Spear answered questions after his talk while refreshments were being served.

Linwood P. Morrison
Secretary-Treasurer

ROCHESTER
Sonnenfeldt Is Speaker; Member to Give Short Talks

The February meeting of the Rochester Branch, AES was held at the Rochester German Club. The meeting was called to order by President **Frank Beuckman.**

Business matters discussed were as follows: The board of managers have suggested that a local Branch member will be asked to give a short presentation at regular meetings to supplement the regular speakers for the evening. A plant visit to Oneida Limited at Sherrill, New York has been suggested and cards sent out to see how many members are interested in such a visit.

The speaker of the evening was introduced by Librarian **Ed Penczek—Rene Sonnenfeldt,** sales engineer for the Sel-Rex Corp. Mr. Sonnenfeldt compared European plating practices to United States practices from pickling to plating. Having worked or visited in many European plating facilities, his information was naturally first hand and there is little doubt but that he covered his subject better than anyone else in the United States could have done. His talk was very well accepted by the Rochester Branch members present at this meeting.

Linwood P. Morrison
Secretary-Treasurer

SAGINAW VALLEY
Ivins Speaks on Plating Room Power

The January meeting was held in the Original Room of Zehnder's Hotel in Frankenmuth on Wednesday, Jan. 14. Thirty-three hardy souls braved the elements to attend. Some of that London, England, fog apparently got sidetracked and settled in the Saginaw Valley.

President **Stew Harger** opened the meeting after a social period and an excellent chicken dinner. Chairman **John Notman** had a few words to say concerning availability of tickets for the Ladies Night Dinner-Dance, Feb. 7. President Harger announced the names of those on the Past Presidents Forum. **F. J. Reha,** Udylite Corp., is to be the moderator for this panel, and members were asked to send their questions to Mr. Reha for presentation to the panel.

The door prize this month was donated by **J. Dunn,** Metal & Thermit. **E.**

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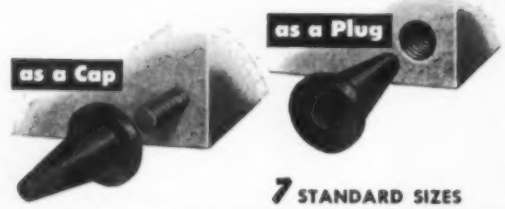

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	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

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Jarvis, Gravi-i-Flo Corp., was the recipient of a very nice decanter set.

Librarian **Art Medwedeff** introduced the evening's speaker, **C. F. Ivins Jr.,** electrical sales manager, Hanson-Van Winkle-Munning Co., whose topic was "D C Power for Electroplating and Anodizing." Mr. Ivins gave a very objective comparison of motor-generator sets and rectifiers. The rectifier section was divided into three types: selenium, germanium and silicon. An interesting question and answer period closed this portion of the meeting.

Entertainment Chairman **Jim Reed** ended the meeting with two fine movies on bow and arrow hunting.

George E. Savage
Recording Secretary

ST. LOUIS
Cyanide Zinc Plating Presented by Gabel

The regular monthly dinner meeting of the St. Louis Branch was held at the York Hotel, with 21 people for dinner. There were 36 present when President **William George** called the business meeting to order. Each person stood and introduced himself and gave his company affiliation. There had been no business meeting in December due to the Plant tour of National Rejectors' plant.

Three men were accepted as new members on a motion by **James Kelly** and a second by **Robert Coulson** that passed without opposition. **Andy Julius** asked that the branch send our ten dollars to the Mid-West Regional for the annual dues. The meeting will be held Jan. 31 in Chicago.

A long discussion was held relative to the possibility of having the 1964 convention in St. Louis. The secretary was instructed to send an announcement of our annual spring banquet to the Midwest Regional before the forth coming meeting. It was approved by a vote of the members present to extend an invitation to eight delegates of the Mid-West Regional to the banquet.

Librarian **Arthur Wrisberg** introduced **Roy Gabel,** research chemist for Allied Research Corp., who talked about Cyanide Zinc Plating. His talk was illustrated by slides which showed the results of variations in temperature, caustic content and cyanide to metal ratio. After an interesting question and answer period the meeting adjourned with a rising vote of thanks for Mr. Gabel.

The St. Louis Branch mourned the passing of one of our older members **Charles McGinley.** Charles had served the branch as Secretary-Treasurer for many years and in recent years often acted as a delegate. He was retired from Wagner Electric Corp. a few years ago, where he had worked as plating room foreman. His passing will represent a great loss to our Branch.

The annual spring banquet of the St. Louis Branch will be held at the Chase Hotel Starlite Roof, Saturday May 2, 1959.

Ward Kelly
Secretary

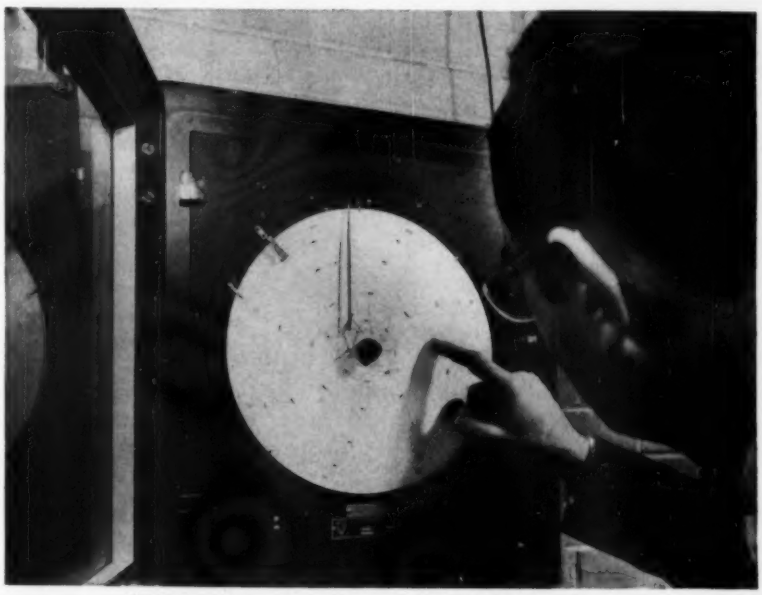
SAN FRANCISCO
Beals to Present Paper on Waste Disposal

The regular monthly meeting was held at the International Inn, South San Francisco, on January 8th. **Jack Hite,** president, called the meeting to order at 8:30 p.m. with 18 members and 12 guests in attendance. A film was presented by the P.G.&E. Company which showed the construction and the operation of the first atomic powered plant for the production of electricity engineered and financed by private enterprise.

Guy Condrett, chairman of the membership committee, announced that two more applications for membership had been presented to the board of managers and that three applicants had been elected to membership.

Trevor Harry, librarian, reported that the speaker for the February meeting would be **Joseph Beals** of Wallace and Tiernan. The topic "Waste Disposal Treatment."

Fred Huntington, chairman of the entertainment committee, reported on the



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success of the Christmas party. Guy Condrett commented on the high quality of the door prizes and the fact that nearly everyone present received a prize.

R. T. Coen
Secretary-Treasurer

SEATTLE-PUGET SOUND

Sollars Talks on Metal Finishes

The January meeting of the Seattle-Puget Sound Branch was held at Andy's Diner, 2963 4th Avenue, South Seattle, Wash.

A steak dinner preceded by cocktails was enjoyed by 30 members and their guests.

The speaker for the evening was **Ray Sollars,** process engineer, of the United Control Corp., Seattle, Wash. His topic was "Requirements and Specifications for Metal Finishes in the Electronics Industry and Relations Between Manufacturer and Metal Finishers."

After a very short business meeting, and introduction of guests and new members, Mr. Sollars gave a very interesting talk with question period following.

Helen Archibald
Secretary

SPRINGFIELD

Panel Meeting Proves Educational

The Springfield Branch met at Blake's Restaurant, on Monday evening, Jan 26, for the regular monthly meeting. President **Edward F. Koetsch** announced the business portion would be dispensed with, due to the technical part of the program.

Because of an unavoidable absence, **Arthur Zavarella** did not give a five minute review, as is his custom, but rather sent a substitute, **Robert Bessey,** a chemical engineer at the Springfield Armory. Mr. Bessey picked a topic from the 45th Annual Proceedings. The subject was: Effect of Shot Peening Prior to Chromium Plating on the Fatigue Strength of High Strength Steel, a paper given by **B. Cohen.**

Librarian **Alexander R. Salmond** introduced **Edward R. Dupuis,** who acted as moderator. Mr. Dupuis introduced the various members of the panel and the subject to be discussed.

The group was as follows: **Walter J. Dyber** of MacDermid, Inc. of Waterbury, Conn., on Nickel and Chromium Plating; **Ralph McCahan** of Dupont, Inc., Hartford, Conn., on Cyanide Solutions; **Wayne B. Sanders** of Mosher Co. of Chicopee, on Buffing, Polishing and Tumbling; and **Theodore Voyda** of Hubbard-Hall Chemical Co. of Waterbury, Conn. on Solution Control. Each gave a preliminary short item on the subject to be covered, and then the whole panel threw themselves at the mercy of the questioners. And the questions came! The entire evening proved highly educational, and one of the largest groups at a meeting was present.

Henry L. Heissfeld
Secretary

SYRACUSE

Korbelak Talks on Precious Metal Plating

The January meeting of the Syracuse Branch was held on the 19th at the Syracuse Turners Inc. Dinner was served at 6:30 p.m., and the business meeting followed at 8. Thirty members and guests were present.

The guest speaker was **Al Korbelak,** sales manager, Sel-Rex Corp. His topic was "Industrial Applications for Precious Metal Coatings." Mr. Korbelak covered the electrodeposition of silver, gold, rhodium and other precious metals that are becoming more important today for electronics, and other special applications.

The membership enjoyed refreshments after the meeting through the courtesy of **Rene Sonnenfeldt,** local Sel-Rex representative.

E. D. Hall
Recording Secretary

BRANCH DIRECTORY CHANGE

MOHAWK VALLEY

Secretary-Treasurer: Henry J. Crouse
1414 Taylor Avenue
Utica, N. Y.

Meeting Place: Thompson's Hotel
Yorkville, N. Y.

Day of Month: Second Thursday
Time: Dinner 6:30 P.M.
Meeting: 8:00 P.M.

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WATERBURY

Sustaining Members Night

The January meeting of the Waterbury Branch was held on Jan. 8 at the Roger Smith Hotel. Representatives of the Sustaining Members were invited to the meeting to witness the Branch in operation and to hear a paper by **Dr. Henry Linford** and **David Feder** on the "Cleaning and Preparation of Metals for Electroplating." The paper covered recent work of AES Research Project No. 12 on the Effect of Oxidized Copper on the Adhesion of Electrodeposits. The paper was well presented and dealt with aspects of plating which are given little consideration. Unpublished data concerning the effect of various known thicknesses of oil deposits were also presented.

After the meeting refreshments were served. The next meeting will be in March at the Roger Smith. On February 14 the Branch will hold its annual Ladies Night with a Valentines Dance at the Chase Country Club.

F. A. Schneiders

AES MEMBERSHIP REPORT

ELECTIONS

Cleveland: E. W. Kaminski Jr., W. Olah, R. Stavely
Detroit: F. C. Davis, R. B. Goodrich, H. S. Trembath, J. F. Vetowich, N. G. Wirick
Indianapolis: J. L. Stockdale, C. R. Young
Lancaster: H. A. Fox Jr.
Los Angeles: C. G. Donella, E. D. King, J. J. Schneider, H. D. Shockley, M. H. White
Miami: W. Hopkins, B. H. Rensin, J. F. Wizemann
Milwaukee: L. C. Briskie, C. F. Kissinger, V. A. Nelson, J. A. Van Westenburg, J. P. Wall
Mohawk Valley: R. A. Bantham, W. L. Mills, W. H. Walczyk
Newark: N. D. Lauterette Jr.
New York: F. DeNisco
Philadelphia: G. M. Creighton, W. Hahn
Pittsburgh: N. P. Rowan
St. Louis: R. H. Bauer, J. Finney, E. S. Weil
San Francisco: L. O. Anderson, E. R. Dodge, D. J. Heinlen, H. J. McQuain, R. L. Teffs
Southern Tier: J. Majka
Toronto: H. J. Hughes, P. Steggall
Twin City: W. M. Bloomquist
Waterbury: G. J. Naves

REINSTATEMENTS

Capitol District: L. Hibbs
Detroit: G. D. Farrell
Hartford: F. Tomasunas
Indianapolis: L. Deer
Los Angeles: J. Wissman (was suspended in error)
Mohawk Valley: R. Howard, J. Jenny, C. Manaseri, J. A. Marchetta, E. G. Warner
Philadelphia: N. J. Maile
San Francisco: B. I. Trygstad
Member-at-Large: L. W. H. Eyers, Birmingham, England

TRANSFERS

Bridgeport: J. P. Courtemanche to Hartford
Buffalo: R. W. Mackey to Philadelphia
Cleveland: K. E. Froebe to Toledo
Detroit: W. W. Brodin from Newark, J. C. George to Boston
Hartford: J. P. Courtemanche from Bridgeport, R. Mullaney to Seattle-Puget Sound
Indianapolis: R. C. Brown from Columbus, R. O. Watson from Grand Rapids
Los Angeles: M. Raskin to San Francisco

RESIGNATIONS

Newark: R. Greiff
Twin City: P. J. Kluber

SUSPENSIONS

Bridgeport: H. Landaman, G. Lewis
Hartford: W. J. Cahill
Lancaster: L. Huber
Milwaukee: F. A. Sinkler, F. Walker
Rockford: C. Bogin, J. T. Gabrielson
Toronto: R. J. Lucy

DEATHS

Detroit: N. L. Goodwin
Los Angeles: H. Kroesche
Newark: V. W. Todd
St. Louis: C. T. McGinley

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CHEMIST—30, married, 3½ years general inorganic research, 1 year plating research, and 2 years plating technical service, wants position with future in electroplating or electrochemical fields. Reply to Box M2, PLATING, 445 Broad St., Newark 2, N. J.

PLATING FOREMAN—20 years experience with nickel, gold, rhodium, tin, white copper, brass, cadmium and zinc. Age 42, married. Am looking for a position in a growing concern that has lots of opportunity for a real producer with ingenuity. I am now employed as a foreman, and have earned last year $7800. Location preferred: Connecticut, Long Island City or New York City. Reply to Box M3, PLATING, 445 Broad St., Newark 2, N. J.

PLATING FOREMAN—age 31, 11 years of progressive, diversified job shop plating experience, which includes makeup, working and maintaining most solutions, still and barrel, anodizing, burnishing and deburring, black oxide treatments on all metals, plating on Aluminum, phosphating, Dow 1 and Dow 7 treatments on Magnesium, production plating of Cu.-Ni.-Cr. on Die Cast parts. Experienced on government specifications, plating thickness control, troubleshooting. Successful in plating odd difficult jobs. Seek position with future in N.Y.C., Long Island area. Reply to Box M4, PLATING, 445 Broad St., Newark 2, N. J.

FINISHING-CORROSION-MATERIALS ENGINEER—With broad experience and background in above lines particularly, covering laboratory, technical sales-service and management. Heavy supervision responsibilities from Manager Chemical Manufacturing Plant to Supervisor, Surface Treatment/Corrosion Lab covering Missile applications. Interest is position challenging ability and long term connection. Resume on request. Reply to Box M5, PLATING, 445 Broad St., Newark 2, N. J.

METAL FINISHING ENGINEER—Age 31, BS Chemical Engineering. 9 years research, technical service, process engineering, product development, chromium chemicals for corrosion control, waste and water treatment, anodizing, chromium plating, metal surface treatments. Will relocate, preferably in the New England or Middle Atlantic area. Reply to Box M6, PLATING, 445 Broad St., Newark 2, N. J.

GOLDEN JUBILEE TRI-STATE REGIONAL AT LOUISVILLE

The annual AES Tri-State Regional meeting is scheduled for April 4 at the Sheraton Hotel in Louisville, Kentucky. Louisville is the host Branch.

Registration will start at 10 o'clock in the morning and will continue until 1:00 p.m.

The educational program will commence at 2:00 p.m. Dr. Henry Brown, The Udylite Corp., has been scheduled as the first speaker. His paper "Mechanism of Electrodeposition with Nickel and Chromium and the Corrosion Resistance of the Deposits." Eugene L. Combs, Diamond Alkali Co., will present "Chromium Plating Up to Date" and James H. Peacock, The Duriron Co., has selected as his subject "Metals and Plastics for Handling Plating Solutions."

A ladies dessert luncheon and program has been planned for 2:00 p.m. The banquet, with entertainment and dancing, will start at seven in the evening. Tickets are $7.50 each. The ticket chairman is J. Muscarella, P. O. Box 14, Louisville 18, Ky.

CHEMICAL ENGINEER—22 years supervisory capacity, technical and production. Background in metallurgy and electrochemistry. Diversified experience includes laboratory and processing control, electroplating, metal fabrication, finishing, heat treating, brazing and welding. Seek position of supervisory responsibility. Prefer East. Will consider other. Reply to Box M7, PLATING, 445 Broad St., Newark 2, N. J.

HELP WANTED

CHEMIST—Analytical control of all plating solutions. Position in large job shop in St. Louis area. State qualifications and expected earnings. Reply to Box M8, PLATING, 445 Broad St., Newark 2, N. J.

SCIENCE OR ENGINEERING GRADUATE—Minimum BS degree, to do electroplating research at modern laboratory located suburban Pittsburgh. Experience desirable but not necessary. Reply to Box M9, PLATING, 445 Broad St., Newark 2, N. J.

PLATING FOREMAN—Large job shop in St. Louis area has a position for a plating foreman. Must be thoroughly familiar with the operation of large fully automatic diecasting and steel nickel-chromium plating machines; knowledge of polishing; and knowledge of plating chemistry. State qualifications and expected earnings. Reply to Box M10, PLATING, 445 Broad St., Newark 2, N. J.

WORKING LEADER, ELECTROPLATER—Thoroughly experienced in silver, gold and rhodium. Copper, nickel, chromium helpful. Must be able to take general instructions and produce good work. Pay open. Location South of Los Angeles in Orange County. Reply giving full details of experience, background and pay expected to Box M11, PLATING, 445 Broad St., Newark 2, N. J.

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FUTURE MEETINGS

AMERICAN ELECTROPLATERS' SOCIETY

March 20,	1959—**Editorial Board,** National Headquarters, Newark, N. J.
March 21,	1959—**Los Angeles Branch,** Golden Jubilee Educational Session and Banquet, Beverly-Hilton Hotel, Los Angeles, Calif.
April 4,	1959—**Fifth Tri-State Regional,** Louisville Host Branch, Sheraton Hotel, Louisville, Ky.
April 10,	1959—**Executive Board,** Statler Hotel, Washington, D. C.
April 11,	1959—**Baltimore-Washington Branch,** Golden Jubilee Banquet and Dance, and "Order of Past Presidents" Award Ceremony, Statler Hotel, Washington, D. C.
April 11,	1959—**Fifth Annual Empire State Regional,** Buffalo Host Branch, Hotel Peter Stuyvesant, Buffalo, N. Y.
April 18,	1959—**Twentieth New England Regional,** Waterbury Host Branch, Hotel Statler, Hartford, Conn.
April 25,	1959—**Milwaukee Branch,** Annual Meeting and Banquet, Schroeder Hotel, Milwaukee, Wis.
April 29,	1959—**Research Committee,** Hotel Statler-Hilton, Detroit, Mich.
May 2,	1959—**Boston Branch,** 23rd Annual Technical Session and Banquet, Hotel Statler, Boston, Mass.
May 2,	1959—**St. Louis Branch,** Annual Banquet and Dance, Chase Hotel Starlite Roof, St. Louis, Mo.
June 15-19,	1959—**Golden Jubilee Convention and International Exposition, Including Fifth International Conference on Electrodeposition and Metal Finishing,** Convention Headquarters—Hotels Statler-Hilton and Sheraton-Cadillac, Exposition—Artillery Armory, Detroit, Mich.
August 22,	1959—**Detroit Branch Stag Day,** Detroit, Mich.
January 15-16,	1960—**2nd Annual Dixie Regional Technical Session,** Saxony Hotel, Miami Beach, Florida. Sponsored by Miami Branch with Blue Ridge and Southeastern participating.
July 10-14,	1960—**47th AES Annual Convention,** Hotel Statler, Los Angeles, Calif.
June 18-23,	1961—**48th AES Annual Convention,** Hotel Statler, Boston, Mass.
June 25-28,	1962—**49th AES Annual Convention,** Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.
June 24-27,	1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City, N. J. Sponsorship Newark Branch.

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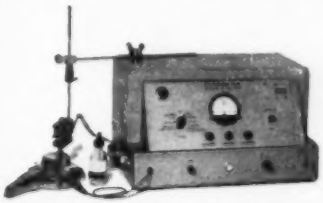

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INTERSOCIETY

May 3-7, 1959—The Electrochemical Society, Spring Meeting, Sheraton Hotel, Philadelphia, Pa.

May 5-7, 1959—14th Purdue Industrial Waste Conference, Purdue Memorial Union Building, Purdue University, Lafayette, Indiana

May 7, 1959—Society of Plastic Engineers, Regional Technical Conference. "Plastics and the Metals Industry," Penn-Sheraton Hotel, Pittsburgh, Pa.

May 16, 1959—Masters' Electro-Plating Association of New York, 41st Annual Banquet, Hotel Plaza, New York.

May 25-28, 1959—ASME Design Engineering Conference and Show, Convention Hall, Philadelphia, Pa.

June 14-16, 1959—National Assn. of Metal Finishers, Annual Membership Meeting, Hotel Statler-Hilton, Detroit, Michigan.

June 15-16, 1959—National Association of Metal Finishers, Management Seminar, Hotel Statler-Hilton, Detroit, Michigan

June 21-26, 1959—American Society for Testing Materials, 62nd Annual Meeting, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.

May 18-20, 1959—Instrument Society of America, 5th National Symposium on Instrument Methods of Analysis, Shamrock-Hilton Hotel, Houston, Texas.

September 21-25, 1959—Instrument Society of America, 14th Annual Instrument-Automation Conference and Exhibit, International Amphitheater, Chicago, Ill.

October 11-16, 1959—American Society for Testing Materials, Pacific Area National Meeting (with Exhibit), Sheraton-Palace Hotel, San Francisco, Calif.

October 18-22, 1959—The Electrochemical Society, Fall Meeting, Deshler-Hilton Hotel, Columbus, Ohio.

DAYTON BRANCH

13TH ANNUAL EDUCATIONAL SESSION AND GOLDEN JUBILEE DINNER DANCE
Hotel Biltmore, Dayton, Ohio—March 7

Speakers:

Dr. Frederick A. Lowenheim, Metal & Thermit Corp.
Ezra A. Blount, Products Finishing
William K. Murray, Enthone, Inc.

Honorary Chairman of Educational Session:
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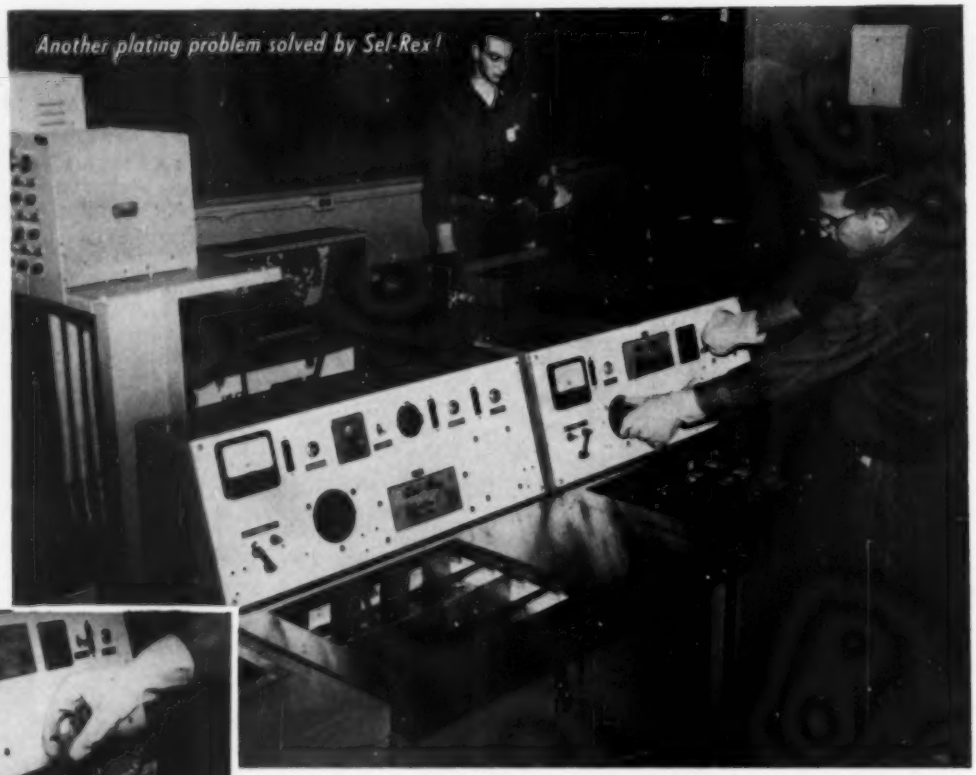

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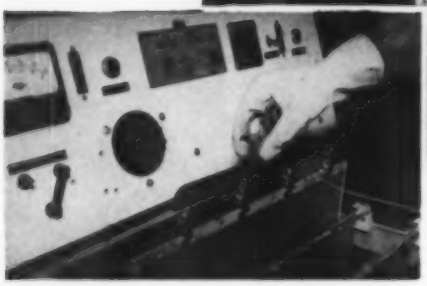

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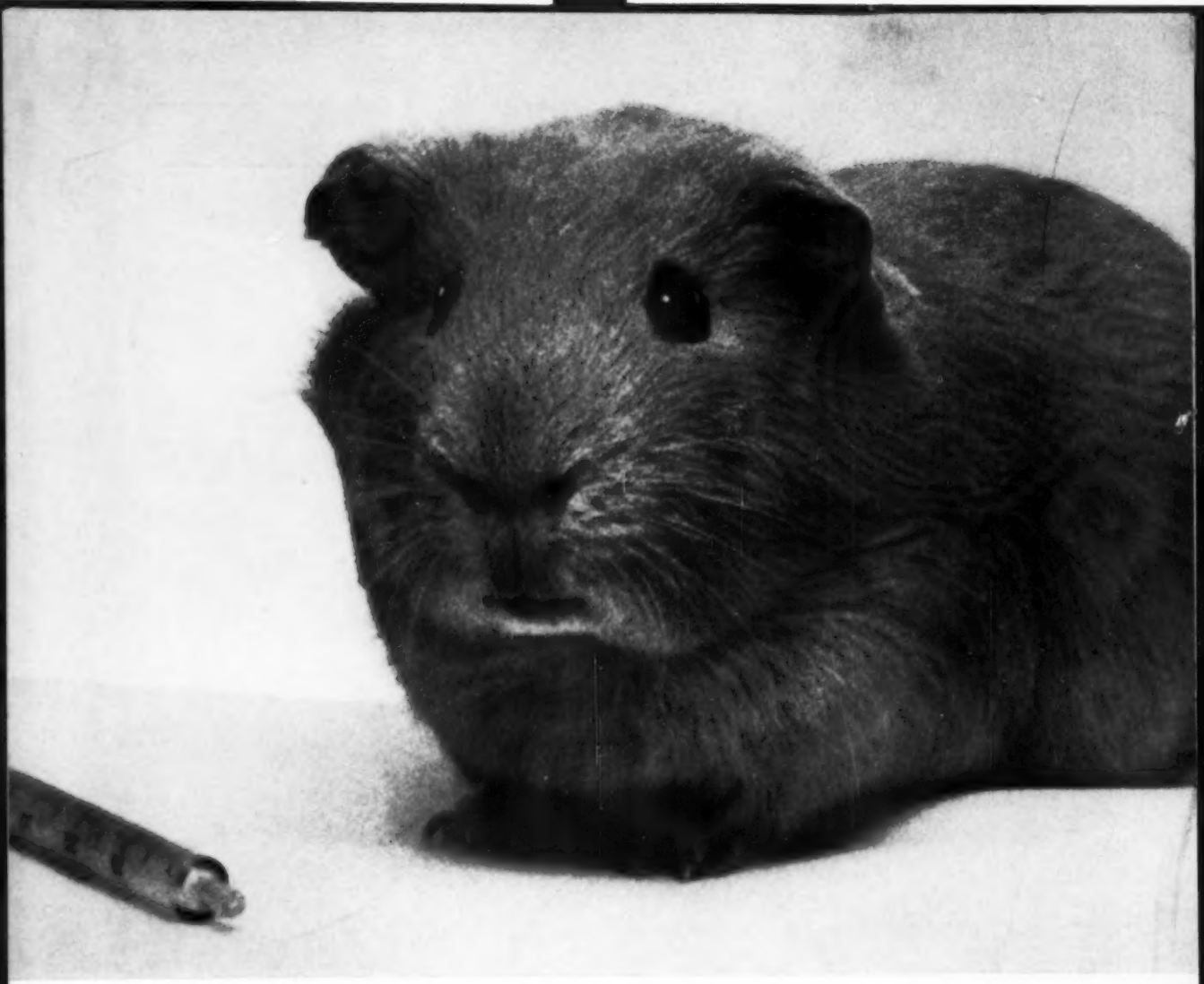

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